

MANKIND

OFFICIAL JOURNAL OF THE ANTHROPOLOGICAL SOCIETIES
OF AUSTRALIA

Vol. 4, No. 8

MARCH, 1952

Price: 4s. 6d

CONTENTS

PLATES R and S. THE COHUNA CRANIUM.

ORIGINAL ARTICLES:

THE COHUNA CRANIUM. DR. N. W. G. MACINTOSH	307
BLOOD GROUPS AND THE POLYNESIANS. DR. J. J. GRAYDON	329
ABORIGINAL IMPLEMENTS FROM CAMP SITES IN THE SOUTH OF SOUTH AUSTRALIA AND VICTORIA. DR. T. D. CAMPBELL AND MISS G. D. WALSH	339

REVIEWS:

South Pacific Commission, Project S.10, Report No. 1. FELIX M. KEESING. (F. D. McCarthy)	342
Lamet: Hill Peasants in French Indo-China. K. G. DIKOWITZ. (F. D. McCarthy)	344

CORRESPONDENCE, NOTES AND NEWS:

Rock Paintings near Glen Isla, Victoria. L. ADAM	343	Sir Wm. Dixon Collection, Australian Museum	346
Pecked-marked Carvings and Sign Talk. W. E. HARVEY	345	Anthropological Society of Victoria. 1952 Syllabus	346

Published by
THE ANTHROPOLOGICAL SOCIETY OF NEW SOUTH WALES.
C/o: Australian Museum, College St., Sydney.

and

Registered at the G.P.O., Sydney, for transmission by post as a periodical.

The Anthropological Society of New South Wales

(Founded 1928)

OFFICE-BEARERS, 1951-1952.

President: Dr. N. W. G. McIntosh, M.B., B.S., Dip. Anthr.

Vice-Presidents: Professor A. P. Elkin, M.A., Ph.D., F.R.A.I., Mr. F. L. S. Bell, M.A., F.R.A.I.

Council:

Mr. A. D. C. Downer, Mr. E. J. Bryce, F.R.G.S., Mr. Carlyle Greenwell, B.Sc.,
Mr. F. H. Molony, A.R.A.I.A., Dr. A. Capell, M.A., Ph.D.

Hon. Treasurer: Mr. F. D. McCarthy, Dip. Anthr. (Syd.), c/o Australian Museum.

Hon. Secretary: Miss G. M. Bell, 164 Prince's Highway, Arncliffe.

Editorial Committee: Mr. F. L. S. Bell (Editor), Mr. F. D. McCarthy, Dr. A. Capell.

Hon. Auditor: Mr. D. R. Wylie, A.C.A. (Aust.), A.C.L.S. (Eng.).

The Anthropological Society of South Australia

(Founded 1926)

OFFICE-BEARERS, 1951-1952.

President: Mr. N. B. Tindale, B.Sc. Vice-President: Mr. T. G. H. Strehlow, M.A.

Council:

Professor A. A. Abbie, Dr. T. D. Campbell, Dr. E. C. Black, Professor J. B. Cleland,
Rev. H. K. Bartlett.

Hon. Librarian: Miss G. D. Walsh.

Hon. Treasurer: Mr. Edward V. Dix.

Hon. Secretary: Mr. E. L. Austin, c/o The Electricity Trust of S.A.
232 North Terrace, Adelaide.

MANKIND

OFFICIAL JOURNAL OF THE ANTHROPOLOGICAL SOCIETIES OF AUSTRALIA

Vol. IV, No. 8.

MARCH, 1952

ORIGINAL ARTICLES:

Australia : Physical Anthropology.

Macintosh.

The Cohuna Cranium : History and Commentary from November, 1925 to November, 1951.¹
By N. W. G. Macintosh, M.B., B.S., Dip. Anthropol., Reader in Anatomy, University of Sydney.

Anyone wishing to read a description of the Cohuna cranium must go to the daily press of the late 1920's and early 1930's, for no full description of it has ever appeared in scientific literature.

The cranium has passed through the hands of a succession of workers, each of whom intended making a description of it available to the scientific world, to the expressed approval and satisfaction of various authorities that this overdue task was about to be accomplished.

In a blast of press controversy, the cranium rocketed to fame in a brief period and was publicized as of brutal form and vast antiquity ; but subsequently faded from the scene almost completely, being relegated to the class of anthropological bric-a-brac.

Curious too is the fact that, while disputing claims for its antiquity, the majority of scientific observers have been impressed on making its first acquaintance.

To write the story of Cohuna one must have recourse to a voluminous file of correspondence, the property of the Institute of Anatomy at Canberra, and the press reports from 13/11/25 to 9/12/31. The references, as far as it has been possible to trace them, are set out in chronological order. The list is long and tedious ; but it is included because it represents a completed investigation, and makes a future search unnecessary.

Mr. George Terry, proprietor and editor, published in the *Cohuna Farmer's Weekly* of 13/11/25 the first description of the "Cohuna skull" and the circumstances of its finding, and suggested that the "skull" would result in a focussing of anthropological thought on the Murray Valley region. Whatever the final decision about the cranium may be, Terry was the first to recognize its possible importance and credit is due to him accordingly.

DISCOVERY

Mr. George A. Gray, contractor, of Cohuna, in November 1925, while ploughing, preparatory to excavating an irrigation channel on Councillor T. Opie's paddock, lot No. 17, adjacent to the northern edge of Kow Swamp, found the plough halted two feet from the surface by a mineralized cranium filled with silt.

Close by an unmineralized female skull was unearthed at a depth of 3 ft. 6 ins. Two chains away portions of a number of skeletons said to represent 11 individuals; were unearthed at depths between 3 ft. 6 ins. and 5 ft.

¹ Delivered as the Presidential Address to the Anthropological Society of N.S.W., 27th November, 1951.

This new irrigation channel measured 5 ft. in depth, with widths of 26 ft. at the surface and 8 ft. at the bottom. Gray said the channel contained no other bones. Sir Colin MacKenzie and Mr. D. J. Mahony have repeated this statement in print. This statement does not coincide with the findings of the Sydney University party which examined the site on 3/1/40 (*vide infra*).

Gray took the two "skulls" to his home, where cracking of the anterior vault of the first was said to have occurred.

They were then taken to Senior Constable Grant at the police station at Cohuna, and there they were seen by Terry.

The skeleton of a modern female aborigine is said to have been unearthed on 9/3/26 at almost the same spot as the Cohuna cranium. This is presumably the one mentioned by Mahony (1936) as having been dug up by "MacKenzie himself . . . at about the same depth" (3 ft. 6 ins. to 5 ft.).

Observing Terry's press contributions, Professor MacKenzie, at that time Director of the National Museum of Australian Zoology in Melbourne, went to Cohuna and secured the cranium.

Gray subsequently claimed compensation for his property—"the valuable skull." His letter and a receipt for £15 which MacKenzie gave him are preserved at Canberra.

It subsequently became, and remains, the property of the Institute of Anatomy at Canberra.

LOCALITY

According to a report by E. J. Dunn, Murchison Medallist and formerly Government Geologist, Victoria, Cohuna township is 10 miles south of the Murray River on Gunbower Creek, a branch of the Murray, and 185 miles slightly west of north from Melbourne.

The cranium was found eight miles south 20° east from Cohuna, north-north-west of Kow Swamp and close to its outlet into Box Creek. Lat. 35° 57' S., long. 144° 18' E.

GEOLOGY (*Dunn's report abstracted*).

The topmost material of the plain at the skull site is light tawny coloured silt laid down in sea water, and of late Tertiary age, consisting of fine silica with just enough binding clay to form hard lumps when dry. Little alteration either by deposition or denudation has occurred since the plain was uplifted, except for a thin film of blown red fine sand of recent age, one foot thick at the site, elsewhere only a few inches thick, or rising in ridges.

"There is no evidence to show whether the skull was buried, left on the surface and gradually embedded, or distributed by water or other means." (Dunn.)

It is possible, but not probable, that high floods of the Murray would reach the site, the trend being to the north.

Kow Swamp is a shallow depression 7 ft. below surface level, which is filled at flood times by channels from the Murray.

PHYSICAL FEATURES (*also from Dunn*).

The plain is not dead level, there being a down trend to the north, towards the Murray, of about one foot per mile, and to the west, of about eight inches to the mile. This trend continues on north of the Murray.

Formerly the area occupied by the Murray Plain was an estuary into which the abbreviated Murray, Murrumbidgee and Darling Rivers emptied silt from a wide area.

Uplift of the country occurred in Late Tertiary time or later and the silt deposit became dry land. The site of the skull is about 270 ft. above sea level.

About 125 miles south of Cohuna is the region of maximum uplift—"The Divide"—1841 ft. above sea level, and the plain commences about 45 miles south of Cohuna. (Dunn.)

"Owing to the peculiarly fine, fattening quality of its natural pastures, it [the Cohuna district] is able, with the aid of irrigation water, to carry a much larger number of fat stock than" other adjacent regions. (*The Argus*, 14/11/25.)

THE "SKULL"

Dunn's account of the cranium (unpublished) is here quoted in full.

"One of the first impressions of this skull is its remarkably well preserved condition. The surface of the skull is rough—owing to a film composed of silt and calcium carbonate—and not smooth as in skulls of more recent date. On the back of the skull a thicker incrustation of carbonate of lime has formed. It is worthy of note in connection with the question of geological antiquity that in no instance had a mineral incrusting layer formed on any portion of the recent aboriginal remains found." (Dunn gives no indication of how he arrives at a classification of "recent aboriginal" remains apart from the incrustation itself.)

"Silt somewhat darker in colour than the general mass and less coherent filled the cranial cavity.

"The skull is now completely mineralized. It is stone, and when tapped by a fragment of skull similarly mineralized, emits the 'clink' characteristic of stone. It has lain so long in the silt that complete replacement of the osseous material has resulted, and there is apparently no trace left of animal matter. This contrasts with other skulls of the 'recent' blacks buried in the same material, for they show no traces of such alteration. In the silt where the skull was found calcareous concretions form, and in some instances until tested were mistaken for mineralized bone.

"It is interesting to note that the left zygomatic arch was broken where the plough struck it. This fracture, as might be expected in such a highly fossilized skull, is quite sharp, clean and white. A fracture around the foramen magnum, though a stony one, occurred a long time ago, for it is stained. Possibly this fracture was caused by recent aborigines who used the site where the Cohuna skull was found to bury their dead.

"Besides the Cohuna skull, fragments of other skulls and portions of skeletons were discovered in the immediate vicinity by Sir Colin MacKenzie in company with Dr. Paul Dane, Dr. C. E. Jelbart and Mr. H. C. Valentine. (Mr. Valentine was the Resident District Engineer, controlling for the Water Commission, Turrumberry Weir on the River Murray, which supplies the irrigation system of the Cohuna region.) The hollows of these fragments were filled with silt. These amount to some fifty pieces in all and are, like the Cohuna skull, completely mineralized. A fragment of skull and a small piece of thigh bone were picked up by the writer near the regulator one and a half chains from where the skull was found.

"All the skull fragments are thickened—reaching in one instance 12 mm."

D. J. Mahony, formerly Victorian Government Geologist and Director of the National Museum, Melbourne, examined the site with MacKenzie in March 1926, and on 23/3/26 in "A Note on the Geological Age of the Human Skull found at Cohuna," recorded his con-

clusions. Some extracts of this were published in *M.A.*, 23/4/26. The full context was published by Mahony *et alii* (1335-42, 1936). He re-examined the geology of the region in the late 1930's, noting that siltation still took place during periodical flooding.

According to Mahony (1337-1341, 1936), "... [the cranium was] covered with a thin iron-stained incrustation which gives a brisk effervescence with hydrochloric acid, and which is evidently composed largely of calcium carbonate and small rounded grains of sand. This mineral coating extends over the cavities formerly occupied by the incisors indicating that these teeth were not in the jaw when the incrustation was deposited."

(This deduction by Mahony is wrong. Development of the cranium by Shellshear between September, 1939, and December, 1940, has revealed the roots of the incisors still in their alveolar sockets.)

Mahony points out that mineral crust accumulates rapidly on organic substances in contact with calcareous salt solutions and is not evidence of "geologic antiquity." He instances that one of the limb bones associated with recent skulls from the vicinity was similarly incrustated. (It will be noted that this is quite different from Dunn's opinion that no mineral incrustation had formed on any portion of the recent aboriginal remains.)

With regard to physiographic features, Mahony says:

"The district is part of the Riverina, Mallee, Wyuna and Murray Plains which extend on both sides of the Murray and except for the Terricks, a group of low granitic hills . . . a few miles to the south-west, the surface near Kow Swamp . . . appears almost perfectly level." One foot interval contoured maps of several hundred square miles confirm this.

The Murray River, Gunbower, Taylor's, Box and Barr Creeks run in a north-westerly direction as far as the Loddon River, and the general grade is one foot to the mile. Recent changes in the stream courses due to floods, droughts, siltings, etc., are indicated by deserted meanders or billabongs. South of a line between Kow Swamp and Kerang "the plains slope northwards at about 3 ft. to the mile."

So far as the geology of the region is concerned, Mahony obtained the history of old wells sunk 30 to 40 ft. in the region and of a bore of 116 ft. in the yard of the Cohuna Hotel. As Valentine saw "all the materials" brought to the surface, and "no fossils" were contained, Mahony considered they did "not belong to the marine Tertiary series."

Making reference to Chapman (1916), Mahony describes the region as "underlain by a series of strata ranging from Miocene to Holocene. The lowest beds are estuarine or swamp deposits . . . of brown clays with some lignite." Subsequent invasion of the sea deposited marine clays and limestones with abundant fossils (Miocene and Pliocene epochs). "Relative uplift of the basin then began" and estuarine beds "with upper Pliocene or possibly Pleistocene fossils" were deposited up to the end of the Tertiary period.

Resting on these are light coloured thin to coarse sands from 20 to 130 ft. without fossils, and indicating a greater rainfall and more active rivers depositing "vast sheets of sand" in the present Murray Basin. These indicate the beginning of the "present terrestrial phase."

Overlying these are red and brown loams also from a few to 130 ft., with layers of iron-stained and concretionary limestone and no fossils. These indicate desiccation; wind deposition and disintegration of surface deposits and "development of the present type of climate."

Mahony's deductions are that "the red loam in which the skull was embedded is geologically recent (Holocene) [and that there are] no adjacent older formations from which the skull could be derived by natural agencies." The skull is too complete to have been rolled far by water, and the absence of the lower jaw and the rest of the skeleton indicates that it was buried not by artificial interment but by natural agencies after being detached by decay; and therefore the "evidence available is against geologic antiquity."

It will be noted that there is one radical difference between the opinions of Dunn and Mahony. Dunn makes the light coloured sand a silt deposit in sea water and gives it late Tertiary age; otherwise their views on the physiography and geology are in reasonable agreement.

Mahony (34, 1943) says that Dr. W. R. Browne, Reader in Geology, University of Sydney, after examining the site in 1940, agrees with his opinions.

CHEMICAL ANALYSIS OF THE SKULL

A report was produced by Avery and Anderson entitled "Determination of the Mineral Content of the Cohuna Skull," presumably at about the same time as Dunn's report was furnished.

The former was not published and cannot be located now, but indirect evidence of its substance can be obtained from the following references:

MacKenzie (29, 1931, MANKIND), writing about the "Jervois skull," says: "It is not a fossil like the Cohuna skull in which the S.G. is 2.71 and the organic material less than 1%. It is reasonable to think he based these figures on the Avery and Anderson report."

Wood Jones (330, 328, 1934) mentions reduction of the 10% fats and 50% organic matters to 0.032 and 0.155% in a "perfectly normal aboriginal type" skull obtained from the Murray basin near Cohuna. Wood Jones, in his paper, was offering data about aboriginal skulls which offset any features in Cohuna claimed as unique. Presumably, therefore, the Cohuna percentages in analyses by Avery and Anderson were similar or perhaps higher than those quoted by Wood Jones.

It is necessary at this stage to record that when the cranium was received by the University of Sydney in July, 1939, the squamous part of the occipital bone exhibited two adjacent and roughly oval areas measuring 29×17 mms. and 23×16 mms. respectively, where the outer table of bone to a depth of 1 mm. had been removed, together of course with the overlying incrustation. The appearance is consistent with the application of chisel and mallet, following outlining by a circular bone saw. There is no record to indicate who removed these flakes.

Dunn stated (*vide supra*) that the back of the skull had a thicker incrustation of carbonate of lime; and if these flakes covered with incrustation were presented as such for chemical analysis, it seems possible that the mineral percentages at examination could be higher than if the original bone alone were submitted.

Secondly, it is unfortunate that the removal of these flakes meant the removal also of the inion from the cranium; the character of the external occipital protuberance must remain unknown and now its position can be judged only approximately.

At 8.15 p.m. on Monday, 19/4/26, MacKenzie delivered a lecture to the British Medical Association (Victorian Branch) at Malvern, officially announcing the Cohuna skull. Abstracts from the "Syllabus of the Lecture" are as follows:

"2. Account of the discovery and geological features . . .

"5. The anatomical characteristics of the Cohuna skull . . . now in the possession of the National Museum of Australian Zoology . . . and its position in the line of human ancestry . . . it presents numerous anthropoid features, particularly characterized by the uniformity of the correlations."

A full account appeared in *M.A.*, Tuesday, 20/4/26, under the headings "Man's Oldest Ancestor—Strange Cohuna Skull—Human Development Illustrated." A précis is as follows:

"The prehistoric skull . . . [was discovered] 2 feet below the surface in red surface loam . . . [its] interior filled with fine reddish sand . . . [typical of] arid regions where there are accumulations of sand drift. [Coating its surface was] a thin iron-stained incrustation similar to the drift within, but containing . . . [according to Mahony's geological report] carbonate of lime which accounted for its coherent nature . . . Seventy feet away at a depth varying from 3 ft. 6 ins. to 5 ft. two modern aboriginal skulls were unearthed."

MacKenzie expressed the opinion that a prehistoric skull would exhibit "uniformly thick . . . enlargement of the ridges above the eye . . . a low flat receding forehead . . . prognathism . . . an enlarged palate with length equal to or greater than breadth . . . a wide nasal cavity, and no ridge of bone separating the floor of the nose from the face . . . a receding chin" and the greatest width of the skull situated posteriorly. He added that all these would appear "in accentuated form in the Miocene ancestor"; and that Cohuna was "the most archaic skull known to Science . . . ante-dating all known human remains including the Java skull cap, Rhodesian, Piltdown and Talgai skulls" and the Neanderthal remains "by unknown ages." As these characters were evenly correlated, the Cohuna skull was not a mere "collateral [but was] in a direct line of human descent." In details of comparison he made the following points:

Cohuna's "low receding forehead had the same breadth as the Java skull cap, the *Java* known, and less than that of the Rhodesian and Talgai skulls." The projection of the upper jaw and the size of the palate "exceeded that of any known human skull." The length of the palate slightly exceeded its breadth, as in the anthropoid, and both diameters "easily exceeded those of Talgai." Furthermore, it was "not horseshoe" in shape. "The diameter [of the] 3 large molars on each side . . . was only equalled by that of the Java skull . . . The greatest diameter of the conical canine teeth exceeded that of the Piltdown remains." The bone reached a thickness of "24 mm." at the eyebrow ridges.

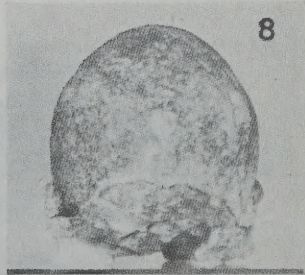
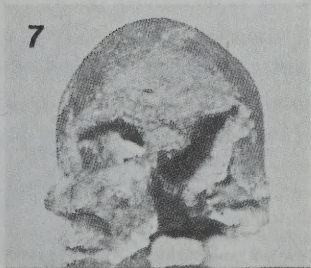
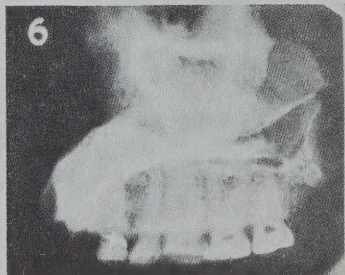
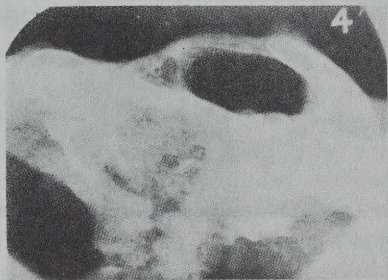
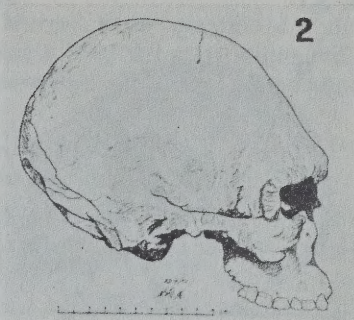
Mongolian, Negro and European types were "only variations [although] specialized . . . [of the] common ancestor of which the oldest type was admitted to be an Australian

LEGENDS TO PLATE R.

Fig. 1.—Typical photograph of the Cohuna cranium as published in the press in 1926. Note the rough surface of the incrustation, the position of the cranium in semi-profile accentuating the eyebrow ridges, and the forward projection of the reconstructed incisor teeth.

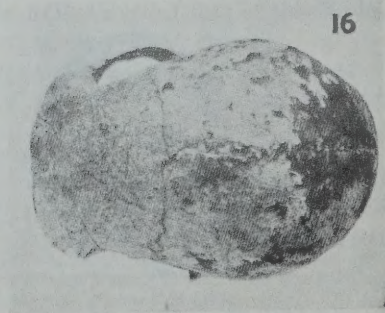
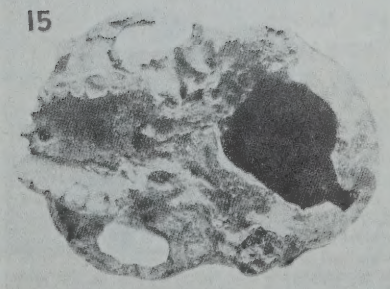
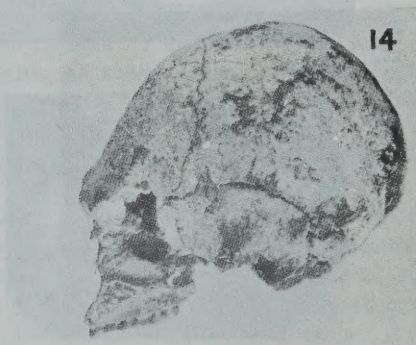
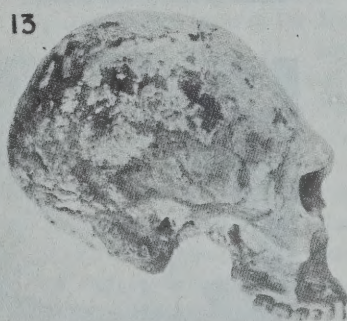
Fig. 2.—Line drawing reconstruction by the writer (N.W.G.M.), showing the Cohuna cranium in norma lateralis oriented in the Frankfort horizon. The reconstruction has been obtained by reference to the measurements which were made over the original incrustation and from photographs. Note the accumulation of mineral deposit, particularly at the lower border of the zygomatic bone and arch.

Figs. 3, 4, 5, 6.—Prints of X-ray films of lateral cranium, right zygoma, right maxilla and left maxilla, taken by Professor J. L. and Dr. K. Shellshear in August, 1939, to show the details of incrustation prior to "development."



THE COHUNA CRANIUM.

THE COHUNA CRANIUM.



aboriginal." This discovery meant that the Murray River constituted "the greatest anthropological field in the world to-day [and that it was] the great responsibility . . . of Australians to unravel the mysteries of these primitive people who in bygone ages inhabited their country."

On the same date, 20/4/26, an almost identical report appeared in the *M.S.P.* under the heading "Long Lost Race," and in the *M.M.P.* under "Romance of Cohuna."

In *Stead's Review* of 1/5/26, pages 17, 18, 19, an article under MacKenzie's name presented almost identical statements; so, there is no doubt of the accuracy of the press reporting, and it seems likely that the newspaper accounts were based on versions prepared for them by MacKenzie. The cover presented a colour drawing, signed Victor E. Cobb 15/4/26, of the cranium with reconstructed incisors.

Furthermore, typescript pages with marginal notes in MacKenzie's handwriting embodying the above comments are stored in the file on the Cohuna skull in the Institute of Anatomy, Canberra.

In *The Australasian*, No. 4034, Vol. CXX, p. 1021, 24/4/26, under the heading "Pre-historic Man, Skull found in Victoria," MacKenzie is quoted in more extreme terms, to the effect that the upper jaw projection "is that of a man in such a primitive form that he had barely learned to stand upright . . . the skull is that of a male who probably shambled along on all fours most of the time and the projected jaw indicates that he rooted for his food in the ground where necessary. He was undoubtedly extremely hairy and by the standards of modern man abominably ugly . . . the palate . . . is enormous . . . and the extraordinary size of the teeth shows that they were intended for crushing the hardest and toughest of food-stuff. No root would have been too tough. The canine teeth . . . larger than . . . in any other skull, show that whatever flesh the man obtained he was able to tear up and devour raw."

Following the claims made in this lecture, the *M.A.*, Tuesday, 22/4/26, published cabled comments. Dr. Butler of the Natural History Museum, London, was reported as stating that, although anthropologists hoped "to discover more ancient human remains . . . Asia was the most likely field." Sir Grafton Elliot Smith, Professor of Anatomy, London, said it seems "incredible . . . that there is the remotest possibility . . . of anything as old as the Piltdown skull being found in Australia . . . where the oldest human remains were probably not more than 4,000 or 5,000 years old." He added that "while final judgment on the Cohuna site [depended on] the evidence provided by Professor MacKenzie [who] is highly competent . . . [it is] a large order to swallow."

Professor R. J. A. Berry, formerly Professor of Anatomy in Melbourne University, was apparently another who disagreed with MacKenzie's views.

The *S.S.* and *S.E.N.* of the same date published photographs of the "Cohuna skull," adding the comment "about the age of which a violent controversy is raging."

LEGENDS TO PLATE S.

Figs. 7, 8, 9, 10, 11, 12.—Photographs of all normæ (not oriented in any particular plane) by Professor Shellshear prior to "development." The reconstructed anterior teeth have been removed and the left maxilla which was detached at the palate fracture line is not shown.

Figs. 13, 14, 15, 16.—Photographs by Mr. S. L. Larnach, orientation in Frankfort plane by Macintosh. Right norma lateralis, left norma lateralis, basalis and verticalis after full "development" from incrustation. Note the palate fracture line in Fig. 15, where the right maxilla has been replaced.

The *M.A.*, Friday, 23/4/26, under the heading "Conclusions of Geologist—Discovery not Archaic," published a statement by Mahony that he had accompanied MacKenzie to the site; and on 23/3/26, i.e. prior to MacKenzie's lecture, he had recorded his own observations, his conclusions being that "The evidence available is against any theory of geological antiquity [although the skull may be] old in the historical sense."

In the same column MacKenzie replied to the scepticism expressed in the cables. He said that "criticism from those who had not inspected the skull and were unfamiliar with the circumstances surrounding its discovery could not be treated very seriously . . . Elliot Smith's statement, that in Australia the oldest human remains were probably not more than 4,000 or 5,000 years old, was entirely unwarranted . . . He hoped that final judgment would be withheld [until publication of the work] under the direction of the Minister for Home and Territories, Senator Pearce [would be ready] probably before the end of the year."

On the same day the *C.F.W.* carried a lengthy article including Terry's own comments and the substance of MacKenzie's lecture.

On 12/8/26 Professor J. L. Shellshear, Research Professor in Anatomy, University of Sydney, having seen the cranium, expressed the cautious view that "it was without question a most interesting specimen."

M.A., 20/12/26, announced that overseas delegates to the Pacific Health Conference were conducted through the Zoological Gardens by the Director, Mr. A. Wilkie, accompanied by Professor MacKenzie; and under the headings "Human Efficiency—Importance of Erect Posture—Anatomical Basis," the *M.A.*, 21/12/26, reported a lecture by MacKenzie before the Pan-Pacific Hygiene Conference to the effect that "the erect posture depended solely on muscular action; correlated was the development of the frontal portion of the brain, which reached its maximum in man; the human type was the most intellectual and also the most erect." Skulls to illustrate the lecture included "the Talgai, the Barham, the Tarwin and the completely fossilized, celebrated Cohuna which shows an absence of frontal region development . . . other evidence of prehistoric man in the form of skull fragments and portions of long bones . . . discovered in Victoria, were exhibited."

Dr. W. M. Strong, Chief Medical Officer and Government Anthropologist of Papua, in moving a vote of thanks, "emphasized the great importance of the discovery of the Cohuna skull."

The *M.H.* of the same date reported on another aspect of the lecture, the developmental history of the human erect posture and its bearing on medical and surgical practice. In the associated demonstration, MacKenzie contrasted "the splendid frontal development and great frontal width" (of Piltown), with "the poorly developed narrow frontal region of Cohuna." He pointed out that "the Heidelberg mandible was too short for Cohuna and failed to cover its last molar tooth . . . The mandible" (reconstructed by him) gave "Cohuna a very formidable appearance . . . The jaw sockets at the base of the skull (Cohuna) were well defined . . . Other prehistoric skulls and long bones found at Cohuna have a chemical composition similar on analysis to that of the Java skull cap . . . up to now regarded as the most highly mineralized portion of skull in the world."

Meanwhile MacKenzie had paid some visits to the site of discovery; some geological surveys and examination of burial grounds had been carried out and a variety of other skeletal remains unearthed. Casts had been prepared under MacKenzie's direction, but it is not clear who made them. Mr. Harry Logan, who was Technician at the Australian

Institute of Anatomy under Sir Colin for many years, said that Mr. Owen, a preparator at the Institute, had used glue (gelatin, *sic.*) to join the maxilla to the cranium prior to making the casts. Possibly a government employee named Decini made them, although Sir Colin had employed Perugia, an expert cast maker from Melbourne, to make others for him. Perugia's method was to pack tightly the interior of the cranium with cotton wool so that when the gelatine had been boiled, allowed to cool to body temperature, and then poured over the cranium, it could not enter the cranial cavity. A suggestion was apparently entertained that Decini might have made the casts and permitted gelatine to enter the interior. If subsequently brought into contact with water, the swelling of the gelatine in any cracks might cause separation. This is of some significance in the later history of the cranium (*vide infra*, 2/7/39). The casts of the partially developed cranium are still on display at Canberra.

From May to August, 1927, inclusive, MacKenzie visited London, Edinburgh and Paris and gave private demonstrations, consulting among others Professor Sir Arthur Keith (of the Hunterian Museum, R.C.S., London) and Professor Marcellin Boule, Director of the Institute of Human Palæontology, Paris.

On 15/9/27 MacKenzie received from Sergeant Grant further skull fragments which he regarded as "belonging to the prehistoric Cohuna race and like the Cohuna skull completely fossilized—practically no organic matter being present. The skull cap is remarkably thick, exceeding in places that of Cohuna skull; but the frontal width exceeds that of Cohuna."

He said it was of the greatest scientific value, and dissipated any idea of Cohuna being a "freak." The fragments were examined by Dunn.

In November, 1927, MacKenzie went to Cohuna to investigate the site and obtain the rest of the remains. These he said were completely fossilized.

It may be that after these finds the terminal paragraph (*q.v.*) of Dunn's report was added to his original three pages.

On 27/1/28 A. N. Burkitt, Challis Professor of Anatomy, University of Sydney, spent several hours examining the Cohuna cranium. In notes made at the time he observed that "the skull was not fully 'developed' or cleaned," and that many measurements he made (for example 12.5 mm. labio-lingual thickness of the canines) did not correspond with Sir Colin MacKenzie's measurements. He also observed that "in the reconstruction of the mandible the molar teeth are completely out of place" and that "no curve of Spee had been allowed for in the reconstruction of the upper incisors." He recorded the bizygomatic as 145 mm., and palate breadth 76 mm.

These notes were not published, but their content was forwarded on request to Keith, who acknowledged receipt on 8/9/29, and to Wood Jones, who acknowledged receipt on 29/9/31.

Nevertheless, Keith (304-II, 1931) gave Cohuna a ranking in the company of *Pithecanthropus* and *Sinanthropus*. Keith's decisions were founded, as he says, entirely upon measurements and sagittal tracings provided by MacKenzie. In the first place, they were made on the specimen still not fully developed from its concretions. In the second, these measurements did not coincide with the unpublished measurements made by Burkitt. In the third place, Keith apparently had misleading geological information in relation to gravel beds. In subsequent publications Keith made no reference to Cohuna.

MacKenzie considered Keith's 1931 publication as being a refutation of the scepticism "of many scientists abroad" and he advised Terry to this effect. A fairly constant corres-

pondence had been maintained between MacKenzie and Terry, and MacKenzie now advised that as the Cohuna skull had "joined the prehistoric hierarchy," a small obelisk or cairn should be erected at the site; this was subsequently done.

The *S.M.H.* of Tuesday, 16/6/31, published an interview with Sir Colin MacKenzie, Director of the Institute of Anatomy, at Canberra on the Monday. The interview can be divided into two parts (1) referring to a skull found in the Jervois Ranges in Central Australia by Mr. Gilbert Rigg, F.G.S., Mining Engineer of Melbourne, about which a monograph was being prepared, and (2) some comments on the Cohuna skull. In the latter MacKenzie stressed the following points:

"Whereas in the ordinary human skull the organic material was about 30%, in the Cohuna skull it was reduced to less than 1%, so that it was practically stone. It was the opinion of many anthropologists that prehistoric man had never existed in Australia" and scepticism had been expressed about the Cohuna skull; "but that the original opinion expressed had been confirmed now by Sir Arthur Keith [and as] numerous other . . . fossilized skulls of a prehistoric nature had been discovered (in the Murray Valley) there was now no doubt that such types existed in Australia before the advent of the Tasmanians who were an earlier race than the Australian aboriginals . . . Scientific opinion was that the discovery had thrown light on the physiology of erect posture . . . [It was] not a matter of academic interest solely . . . Professor W. A. Osborne, of Melbourne, was of the opinion that the only speech the owner of the Cohuna skull could have made was a guttural noise."

In the *S.M.H.* of Monday, 20/7/31, a correspondent to this paper, A. R. Wilkie, gave a fairly comprehensive, but uncritical summary of comments on the Cohuna skull since 19/4/26.

At this stage in the history of the Cohuna cranium, discussion of it became linked for a brief period with the Jervois specimen, the official announcement of which was made by MacKenzie at the Australian Institute of Anatomy before members of the Canberra Medical Society on Monday, 27/7/31.

It was reported in the *Canberra Times* and the *S.M.H.* of Tuesday, 28/7/31, as follows:

This skull was found in the Jervois Ranges in Central Australia, lying in a mulga bush beside the skeleton of a modern female aborigine, said to have been killed by her tribe for having acquired the skull in west Queensland, imagining it to be that of her dead baby and subsequently carrying it in her dilly bag. Found by an explorer and prospector in Central Australia, Mr. James O'Neill, it was given to Mr. Charles Gibson (Mining Geologist), then to Rigg, and finally to Mackenzie. Rigg unsuccessfully led an expedition in search of the mandible and thigh bones belonging to the skull.

MacKenzie's reported statements are that the skull is of "a 30 year old adult . . . [bone thickness] varying from 5 mm. minimum to a maximum of 13 mm. behind and 15 mm. in front . . . the capacity is less than 1,000, lying between 956 and 980 . . . This is the lowest known cubic capacity of any complete human skull."

He expressed the view that Jervois was supplementary to Cohuna, the latter having a facial skeleton which was lacking in Jervois and Jervois having a non-fossilized brain case which could be divided; that the "Jervois skull and brain and the Cohuna fossil constitute, from their medical value, the most important of the lowest prehistoric documents in the world to-day . . . [that further] correlated specimens from the Murray Valley [are being supplied] thanks to the investigations of Mr. Murray Black." (Mr. Black has long been an enthusiast in skeletal discovery, co-operating first with Sir Colin, and subsequently with the University of Melbourne.)

MacKenzie (29, 1931) said: "A brain cast [of Jervois] has been made and, from the point of view of the interpretation of the modern brain, this can be regarded as the most primitive known."

S.M.H., 29/7/31, published Elliot Smith's opinion (cablegram—London) that the word "prehistoric" was "quite unintelligible"; also Wood Jones' view that the claims were "frankly ridiculous."

S.M.H., 30/7/31, published further comment by Wood Jones: "Jervois . . . skull of a modern aboriginal woman . . . It was hopeless to expect to find the earliest types of man [in Australia . . . since he] came by boat . . . a fully developed *Homo sapiens*."

MacKenzie said, "In no circumstances will I enter into a newspaper controversy with Professor Wood Jones." Nevertheless the announcement of Jervois had reawakened opposition to MacKenzie's views on Cohuna and MacKenzie did embark on an acute controversy with Wood Jones.

S.M.H., 5/8/31, published comments by William Wright, Professor of Anatomy, London University, made in Adelaide on his arrival to conduct the Primary F.R.C.S. He thought that there was "no doubt that man came to Australia after the continent was separated from the Malay Peninsula and the presence of the dog argues set purpose rather than drift by accident." He refused to express an opinion about the Jervois specimen, saying that geological conditions were "a far more trustworthy guide to age than cranial capacity."

S.M.H., Saturday, 8/8/31, reported remarks by Dr. Herbert Basedow in Adelaide on Friday. "The skull was not prehistoric but it embodied several morphological characters which must be regarded as entirely atavistic. He had inspected the Jervois skull at Canberra and "the smallness . . . was undoubtedly remarkable . . . while the thickness of the cranial wall . . . was no less striking . . . Science is deeply indebted to Sir Colin MacKenzie for having directed attention to a remarkable type of primitive Australian which throws considerable light upon the probable appearance and stage of evolution of the immediate ancestors of the present aborigines."

The *M.A.*, Monday, 10/8/31, announced that the Royal Society proposed to hold a symposium on Thursday night to discuss the authenticity of the Jervois skull as a prehistoric representative. It added some further comments by Wright, repeating his doubts that the Jervois skull could rank with the Java and Pekin skulls in primitive characteristics.

M.A., Friday, 14/8/31, reported the symposium of the Royal Society of Victoria. Casts of Jervois, Java, Pekin, Talgai and other ancient skulls were exhibited together with two modern aboriginal skulls for comparison. Mahony and Summers (Geology School, Melbourne, and Associate Member of Royal Society of Victoria) referred to the complete lack of geological evidence of antiquity in the Jervois skull and Professor F. Wood Jones, in referring to its anatomical features, pointed out that published measurements of 1500–2000 Australian aborigines were available for comparison and the Jervois skull was in no way remarkable; "it most certainly is not the smallest capacity ever recorded in a complete human skull."

The *M.A.*, Monday, 17/8/31, published a statement by Mr. J. A. Kunoth from Adelaide claiming that he had found the Jervois skull on his land in the Jervois Range, that he knew the old gin Oochrima, to whom it belonged, and that she had died three years previously. He considered "Sir Colin a long way out in his reckoning of the old gin's age." It seems likely that Kunoth was confusing the calvarium alleged to have been carried by the gin with the skull of the dead gin herself.

Both the *M.A.* and the *S.M.H.* of Monday, 17/8/31, published statements by MacKenzie from Canberra replying to his critics. He pointed out that O'Neill had furnished an official report of the discovery at the request of the Minister for Home Affairs (Mr. Blakeley). He had emphasized to the Canberra Medical Society that the "matter was of medical and not geological interest . . . to be primitive a specimen need not necessarily be geologically old . . . he had said . . . that the skull was not a fossil like the Cohuna skull and that its age could not be calculated . . . the main value of the skull was that it provided a complete brain cast of a healthy adult primitive skull with a capacity less than 1000 c.cs. . . . the combination of primitive features seen on it had never previously been demonstrated on any normal human adult brain. If there existed in Australia hundreds of modern aborigines with a brain capacity less than that of the Jervois skull and even less than 900 c.cs. . . . there was less discrepancy between the brains of apes and those of modern aborigines than between those of modern aborigines and white people."

The *M.A.* and *S.M.H.*, Wednesday, 19/8/31, under such headings as "Jervois Skull controversy continues, Aborigine and Ape Man," published further comments by Wood Jones. He said, "it is all to the good that Sir Colin MacKenzie has withdrawn his claims about the geological antiquity . . . and the Jervois skull can be judged solely by the standards of modern Australian aboriginals." He offered to forward to MacKenzie a list of registration numbers of Museum skulls with a cubic capacity less than the Jervois. He claimed that MacKenzie had confused cranial capacity with brain volume and that the figures quoted by MacKenzie were in any case erroneous. He quoted Cuvier 1900 c.cs. and Anatole France 1060 as indicating range of brain volume, and pointed out that the gulf between ape and aborigine was far greater than between aborigine and Anatole France.

He also said "Sir William Turner half a century ago forestalled me by recording 930 and 946 c.cs. as the cranial capacity of two female Australian aboriginal skulls."

He added: "Sir Colin MacKenzie has, may be, done well in bringing to the public notice the interest which attaches to the primitive living Australian aborigine, even if his methods have been perhaps unduly dramatic."

In the *M.A.*, Thursday, 20/8/31, MacKenzie replied that "it was incredible that any scientists should have put up a campaign against the skull without having seen the original . . ." He contrasted Wood Jones' attitude with that of Basedow, who "came to Canberra and examined the original specimen before expressing an opinion. It is interesting to note that he is in complete agreement with the original pronouncement." (This last sentence was, of course, somewhat of an exaggeration on MacKenzie's part.)

The *M.H.* of Thursday night, 20/8/31, carried the statement by Wood Jones that he refused to have any more to do with the skull or the controversy.

That a stage had arrived when the controversy was passing from polemics to fantasy is indicated by a publication in the *S.M.H.*, 21/8/31, wherein Mr. Keith Kennedy, Assistant Editor of *MANKIND*, writing from the Australian Museum, drew attention to MacKenzie's short article in *MANKIND*, and suggested that criticism of MacKenzie was misdirected. He added that "there was no reason why Java man could not have had enough intelligence to make rafts and canoes and so reach Australia."

The *M.A.* of Saturday, 22/8/31, published a final statement by MacKenzie to the public.

He said the Jervois skull was "essentially a medical document." In its brain cast "the complexities of the modern brain were revealed in their simpler form . . . A modern

scientific expedition had arrived this week to spend a year in North and Central Australia . . . It was time Australians woke from their slumbers on scientific matters."

In official correspondence MacKenzie was at this time referring also to communications from the University of Texas *re* prehistoric man in Australia.

The *S.M.H.* of Saturday, 29/8/31, published abstracts from an address by Mr. Heber Longman, Director of the Queensland Museum, to the Constitutional Club in Brisbane on Friday. Longman produced the skull of an Australian aboriginal woman which he said was a parallel of the Jervois skull, and he was reported as suggesting "that the recent sensational claims of Sir Colin . . . were those of a man so interested in his own work and obsessed by the fascination of his own researches that he did not allow himself sufficient time to examine the significance of the records compiled by other people."

It was following this controversy that Wood Jones commented on the 145 mm. bizygomatic measurement of Cohuna as not unusual, being as much as 150 in recent aborigines, the Cohuna palate breadth of 76 being exceeded by measurements up to 80. (These measurements had been made by Burkitt—*vide supra* 27/1/28.)

On 14/11/31 the *S.M.H.* produced another article on the Jervois skull, but by December 9th, as the *S.M.H.* put it, "casts of the Jervois skull failed to arouse interest in England."

Discussion died down on both Cohuna and Jervois; and Wood Jones (324, 1934), writing of contrasting types of Australian skulls, placed the Cohuna skull (measurements of which he based on Burkitt's 1928 notes) with the Tamworth skull of Burkitt and Hunter, 1922, the Wentworth skull, the Halford skull (1878), and others described by Flower (1907), and Barnard Davis (1875), grouping all these as characteristic of rugged, massive Australian skulls of exaggerated masculine appearance. He classed Jervois with small normal female skulls. He relegates all to Boule's class of anthropological "bric-a-brac."

On 17/7/36 Professor W. K. Gregory, Curator of Comparative and Human Anatomy, the American Museum of Natural History, New York, acknowledged receipt of a cast of Cohuna from MacKenzie and commented:

"Assuredly, whatever the exact age of the Cohuna skull may have been, its morphological characters mark it as one of the most primitive of all skulls that may be referred to *Homo sapiens*. You and your Museum are surely to be congratulated upon possessing the original of this valuable relic which goes far to support the claims of the Australian aboriginal skull to be the most primitive among all still living races." (This cast was also of the not fully "developed" cranium.)

Sir Colin's health had been unsatisfactory for some time, and he retired towards the latter part of 1937.

On 25/2/38 Dr. Joseph Birdsell presented a letter of introduction from Professor E. A. Hooton of Harvard University to Dr. C. V. Mackay, who was then Acting Director of the Institute, and between then and June, 1938, made some examination and perhaps measurements of the Cohuna cranium at the Institute. He took back to the U.S.A. a cast made prior to the restoration of the incisors and left canine.

Mr. N. B. Tindale, Ethnologist, South Australian Museum, who had been associated with Birdsell, also obtained a similar cast and one of the reconstructed mandible and of the unrestored palate for display in the South Australian Museum.

On 13/7/38 Dr. J. F. Fenner applied to Dr. F. W. Clements, Director of the Institute of Anatomy, to work on the Aitape and Cohuna specimens. Clements, 31/8/38, pointed out

that measurements had been taken by Birdsell and independently by Hector G. Jones, B.D.S., of Toowoomba. On 13/9/38 Jones applied for facilities to make more extensive studies of the maxilla. At this stage Clements was hopeful that a publication including a description of the discovery of the cranium, its affinities, its non-metric and metric characters and a detailed examination of the teeth and palate, would be produced by Jones, and that Fenner would include some of its measurements in a paper dealing with a comparison of 1000 aboriginal skulls in various Australian museums.

Clements had written to Keith, 26/8/38, asking him if he would critically review such a manuscript. Keith agreed and suggested that a brain cast might be obtained from the undivided skull through the foramen magnum. Between 13 and 23/11/38 Jones, on enquiry, found that Logan considered an endocranial cast could not be obtained without dividing Cohuna and that Perugia had previously given a similar opinion. Clements, as custodian of the cranium, was naturally reluctant to sanction its division. To expedite some conclusions Clements sent Keith a paper on the geological background of the Murray Valley and also a cast of the Cohuna cranium, but not of the reconstructed mandible which most people considered too artificial.

Overseas interest had not entirely waned; for example, on 18/2/39 J. C. Trevoir, of Emmanuel College, Cambridge, asked for a cast and for copies of any relevant publications. A cast was sent on 24/3/39 with the comment that only two further casts remained at the Institute.

A preliminary description, together with photographs and tracings, were sent to Keith by Jones. Keith returned these in March, 1939, with the comment that the skull must be cleaned right down to the bare surface before descriptions and measurements could be valid; that MacKenzie's plaster restorations of the maxillary incisors must be removed; also that the base, right mandibular fossa, nasal cavity and sutures required special accurate description. Jones frankly admitted that he had not recognized that the skull was only partially developed and asked Clements to obtain assistance for him from Sydney University to have it cleaned and an endocranial cast made. Clements wrote to Burkitt on 27/4/39 for advice, indicating that he was "particularly anxious that a description of this skull should be printed as soon as possible, but . . . equally anxious that it should be up to recognized standards." Burkitt replied on 5/5/39, "I am fully in agreement with your contention that a complete and accurate description of the skull should be published, judging from my notes made in 1928 . . . I should expect that it would still take several months to clean properly." Clements replied to Burkitt, 12/5/39, "I agree with you most emphatically that it is time something got into print. Mr. Jones . . . has relinquished the skull and will submit the palate and teeth, this means that the skull is back where it was in 1936."

The cranium was despatched to Jones on 21/6/39 so that he could make photographic enlargements of the individual teeth to study the cusp patterns more fully. On 2/7/39 Jones, while cleaning the teeth with a nail brush, soap and water, saw the left palate, maxilla and zygoma separate from the cranium. Fearing that progressive damage might be occurring, he sent it at once to Sydney University and on 3/7/39 informed Clements of his action, commenting that the washing had disclosed a crack through the entire length of the palate. Clements replied on 6/7/39 that "the last time Burkitt inspected it he foretold the presence of a crack or some similar change to produce the asymmetry seen when inspecting the skull from the front. He was under the impression that the earth pressure had pushed up the maxilla and the zygoma on one side."

Discussion between Clements and Burkitt resulted in the decision that the cranium would be cleaned and dealt with by Burkitt and Shellshear but that Jones would be permitted to complete his work on the teeth and palate.

X-RAYS

Shellshear took a series of X-ray pictures to determine the amount of breakage and incrustation before commencing "development" of the cranium.

27/7/39. Right zygoma, lateral.

14/8/39. Left molars. Detached maxilla and teeth. Right zygomatic basal region and maxilla (before treatment).

15/8/39. Right zygoma. Undersurface of left maxilla (to ascertain line of fracture for reconstruction), supraorbital edges (details of incrustation).

8/9/39. Photographs of all normæ before treatment.

He found the cranium to be covered with an incrustation varying in depth from $\frac{1}{4}$ in. over the zygoma to $\frac{1}{8}$ in. and $\frac{1}{16}$ in. over the superciliary ridges and skull generally." Shellshear subsequently "developed" the exterior of the cranium.

The writer is indebted to Drs. J. L. and K. E. Shellshear for permission to reproduce in miniature these original X-rays and photographs, and expresses thanks accordingly. It is interesting to note that trabecular structure is clearly discernible in these X-rays taken through the "undeveloped" mineral incrustation.

Professor H. Priestley, Department of Biochemistry, University of Sydney (in personal communication with the writer, 28/6/49), said that "Dunn's original statement was correct in that organic material had been replaced and the Cohuna cranium was literally stone. The replacement represented loss of calcium phosphate and substitution by calcium carbonate." In addition to analysing chemically a small piece of the cranium, Priestley who was present when the accretions were being removed by Shellshear, had observed a small parchment-like patch of different looking material over the malar region as it was being "developed." Analysis of this material by Priestley gave a positive reaction for keratin.

There is no literature dealing with the persistence of keratin, but the possible presence in or on the skull of organic matter derived from the gelatine used in casting operates against the application of this observation.

After thorough consultation of literature relative to fossilization and mineralization, Priestley had concluded that distinction between the two could not be made, and considered that neither a further search for what elements are present in the skull, nor a further organic examination, would help dating of the skull. Dr. D. P. Mellor, Reader in Chemistry, University of Sydney, tells me (17/10/51) that crystalline radiography, in the hope of observing alterations of the patterns of the crystalline material, would not help in dating the cranium.

As far as Australia is concerned, the C^{14} and the Fluorine examinations are not readily available. The C^{14} method is probably of no value with the Cohuna specimen; the quantity of material required would involve destruction of the entire cranium and the leaching resulting from the repeated flooding of the site where it was found would almost certainly invalidate the application of the C^{14} method, even if enough material were available.

Possibly some assistance would be obtained by the Fluorine method; but this too is doubtful. Although one requirement of the test is observed, namely that the cranium is from "a matrix permeable to ground water or percolating moisture," no pilot series of

undoubtedly contemporary fossil bones is available. Further, as Oakley (47, 1949) indicates, "Fluorine content is unreliable . . . where the conditions . . . are liable to produce extremely rapid and variable mineralization" and also "where porous bone is impregnated with silt; or where the phosphate has been largely replaced by a secondary mineral." Oakley instances "the Kenya bones where the phosphate has been replaced by silicate at an early stage of mineralization, thus precluding the continuance of fluorine fixation."

This is precisely what appears to have happened to the Cohuna cranium. Firstly, the views of Dunn and Priestley are that the osseous material has been completely replaced, calcium carbonate having been substituted for calcium phosphate, and the available evidence suggests that mineralization in the Murray region is rapid; Mahony (33, 1943) mentions coating and impregnation with carbonate of lime "in a few weeks." Secondly, silt contamination of its cancellar bone seems more than likely.

On 7/10/39 Dr. Daniel S. Davidson, about to return to Philadelphia after a year's anthropological research in Western Australia, asked for a cast of Cohuna and was advised by Clements, 11/10/39, of the new work of "development" in hand, and of the invalid nature of the old casts.

On 3/1/40 Professors Burkitt, Shellshear, Priestley and Browne visited the site of the discovery. Priestley picked up a tooth on the very spot and in the dug-up heaps at the site were pieces of tibiae, etc., in the same incrustated state as the skull (earlier statements inferred that the area had been sieved).

They regarded the region as subject to frequent over-floods; and teeming with birds and vegetation, it constituted an ideal site for rapid water mineralization (*vide supra*, Argus report 14/11/25 also), and an ideal region to have supported a large aboriginal population.

Mahony, 16/1/40, wrote to Burkitt: "It is very good news . . . publish a description of the Cohuna skull, which has too long remained part of a skeleton in the cupboard."

Tindale (145, 1941) stated: "Recent examination of the Cohuna site, in Victoria, has yielded indications that the Cohuna mineralized cranium was derived from the same beds as a species of thickshelled, fresh-water mussel (not yet described) different from that represented in the present lagoon. The recent species is found also as food debris in an upper bed, associated with unmineralized human burials of present-day aborigines."

To the best of the writer's knowledge, no description of the "indications" in the above quotation has been published. Possibly it is implied that at Cohuna a comparison of *Unio* shells can be made similar to that in the Tartangan site (Hale and Tindale, 154-7, 1930).

The claim there was that a spot graph of greatest shell thickness against umbo-ventral height for living specimens and for fossil specimens from Tartangan layer C, showed consistently thicker shell for the latter and permitted their classification as *Unio* (*Hyridella*) *provittatus* sp. nov.

Following conchological and palæontological enquiry in Sydney (Miss J. Allan and Mr. H. O. Fletcher), it is understood that thickness of shell in *Unio* may also vary greatly under the influence of a variety of conditions including environmental, climatic and age.

In any case it is difficult to see how this can be employed because there appear to be no valid means of proving the Cohuna skull's genuine *in situ* associations. Its depth from the surface was only two feet, of which the superficial half is wind-deposited sand, and both mineralized and unmineralized skeletal material has been unearthed from greater depths at the same site; but it is in this aspect that a fluorine test may be helpful if it can be applied.

Mr. H. M. Hale, Director of the South Australian Museum, 14/1/41, asked for a second cast of Cohuna and enquired when replicas of the cleaned cranium would be available.

Clements replied on the 17th that no spare casts were left and "Shellshear has produced so many extensive changes in the cranium of the skull that I doubt if any good purpose would be served by studying the old cast."

Fenner (352, 1941) published eleven measurements of Cohuna after it had been "developed" by Shellshear. They are as follows:

Smallest frontal breadth	..	..	(ft. -ft.)	86
Post-orbital breadth	..	..	..	90
Greatest frontal breadth	..	..	(Co. -Co.)	105
Stephanion breadth	..	..	(st. -st.)	95
Median sagittal frontal arc	..	..	(n. -b.)	140
Median sagittal frontal chord	..	..	(n. -b.)	126
Angle of frontal convexity				147°
Angle of convexity of cerebral part of frontal bone	..	..	..	158°
Upper facial breadth	..	..	(fmt.-fmt.)	117
Anterior inter-orbital breadth	..	..	(mf. -mf.)	27
Orbital breadth	..	..	..	44

Burkitt, 20/3/41, wrote to Clements: "We all look upon it as being simply an Australian aboriginal skull at the primitive end of the normal range of variation, possibly near the Talgai."

Shellshear, 8/12/41, wrote to Clements *re* protection (during the war) of Talgai, Cohuna and the cranium of an aboriginal female of quite normal appearance from the Murray region in much the same state of mineralization as Cohuna. Clements replied, 11/12/41, "I think you people can protect Cohuna as well as we can and if you are willing to look after it for me I am perfectly happy."

Mr. Johnson, the American Minister to Australia, wanted to compare with Cohuna a complete cast of Pekin man which he possessed, and Clements wrote to Jones, 7/1/42, "If I could show Mr. Johnson your article, at least I could show that we had done some work on Cohuna." Jones had submitted a thesis in 1939 to the Faculty of Dentistry, University of Sydney, and been granted a doctorate. The thesis included a description of the teeth and palate of the Cohuna specimen. It was not published.

Mahony, 11/8/42, wrote to Clements requesting a cast of Cohuna for the National Museum and asking also, "Is a description of the skull being prepared for publication?"

Clements realistically replied on the 14th, no cast available, and if there were, he would be loth to send it, "for all existing casts represent the Cohuna skull in the undeveloped state . . . such as Shellshear had finished indicated that the existing conception required radical adjustment to conform to its discoveries. Under these circumstances I think it would be wrong to exhibit existing casts as representing the true Cohuna. It is my ambition when the existing development is completed to have another set of casts made . . . under present circumstances it would seem that this will not occur until after the war is over."

Mahony, 24/8/42, in a letter to Shellshear, commented: ". . . the Cohuna skull which will now emerge from the fog of mystery that surrounds it," and in a letter to Clements on 28/8/42 drew attention to a statement in Keith's "New Discoveries . . ." which inferred

that MacKenzie had four other fossilized human specimens from the same region. Clements in his reply, 1/9/42, said: "There is no record of these fragments at the Institute."

On 2/9/42 Mahony wrote to Clements to the effect that he had prepared a summary of publications on mineralized human remains in Australia.

On 13/10/42 Burkitt wrote to Clements: "Shellshear and I have given Mahony a short note: The Cohuna skull when properly developed came within the range of the modern aboriginal skull in all its measurements . . . being simply a somewhat fossilized normal aboriginal skull."

Campbell (Pl. XIII, 1942) suggested a reconstruction of the anterior teeth of Cohuna, which instead of the highly simian appearance seen in MacKenzie's reconstruction show no special simian features, and conform with the large arches frequently seen in aboriginal skulls.

Mahony (34-35, 1943) published the consensus of opinion obtained from Burkitt, Shellshear, Priestley, Browne and Campbell that the Cohuna skull, when properly "developed," came within the range of the modern aboriginal skull in all its measurements and may be relegated to modern category.

Hooton (357, 1946) refers to the Cohuna specimen as "a very primitive appearing, adult male with exaggeratedly Australoid characters."

Brodrick (69, 1948), in a short comment on the Cohuna specimen, notes that "This cranium has been by some compared with the Solo skulls from Java, but the Cohuna is undoubtedly sapiens," also "it is true that the primitive features noticeable in living Australians are accentuated in the Cohuna cranium."

A letter, 22/11/49, from Mr. R. Stone, Curator of the Institute of Anatomy, to Macintosh indicated that the Institute still had three casts of the undeveloped cranium (two on exhibition).

Hale, 11/10/50, wrote to the Director of the Institute, saying that the Adelaide Museum had during the war shifted material for safety to a tunnel in the hills. Among other specimens that were lost was the cast of Cohuna. The Museum wished to obtain another "in view of the importance of this interesting specimen."

Dr. E. H. Hipsley replied, 24/10/50, directing attention to Mahony's publication (34-35, 1943) and saying that if in view of these more recent investigations a cast was still desired, a spare one was available and would be sent.

Hale replied the same day, asking for the cast, and adding "The specimen will always be of interest to anthropologists despite the conclusion reached by some observers . . . after independent examination of the site and study of the specimen Dr. J. Birdsell and Mr. N. B. Tindale came to conclusions which tended to support the presence of two series of bones at the Cohuna site and that mineralized bone was present as well as fresh material. This is supported by the existence of a stratum within the irrigation channel containing an extinct species of *Unio* shell . . ." (*vide supra*, Tindale, 145, 1941; also Hale and Tindale, 154-157, 1930). The cast was sent on 24/11/50 and acknowledged on 6/12/50.

Some elaboration of this view is possible, in that among the few crania from this region possessed by Sydney, and the large number possessed by the Melbourne Anatomy Department, there is a continuous grade from heavy, through moderate and slight down to non-mineralization. There is also a continuous morphological grade from extreme ruggedness and size down to smoothness and very orthodox measurements. But these ranges, A of

mineralization, and B of morphology, do not graph as parallels ; on the contrary, they are quite haphazard.

Wood Jones (1934), Mahony and Wood Jones (1937, 1936) expressed this more briefly in referring to the morphology of mineralized skulls from regions both north and south of the Murray.

It is an obvious thought that heavy represents a longer passage of time than does slight mineralization. There is also the obvious fact that floods and droughts, continuously changing courses of meanders, creeks and even larger channels, are subjecting different sites to fluctuating mineral concentrations both at the same and at different periods.

In 1949 and subsequently Burkitt and Macintosh re-examined the Cohuna cranium in the course of writing an article on "Early Man in Australia" for "The Australian Encyclopædia," which awaits publication.

Subsequently the writer continued the examination of the cranium.

SUMMARY AND CONCLUSIONS

The position of the Cohuna cranium to-day is that it has been dismissed in rather summary fashion. It is suggested that the subject should be reopened for the following reasons :

The general morphological appearance is not very dissimilar from Talgai and Keilor, and the profile is like that of Talgai if allowance is made for Talgai's youth.

It lies nearer to the extreme limit of anatomical range presented by Talgai than does Keilor.

The Cohuna facial skeleton and palatal development are unusually powerful, at the more primitive end of the scale of modern aboriginal morphology. Burkitt (1928) referred to Talgai as having "considerable affinity with Cohuna—in the massive eyebrow ridges, powerful maxillæ and molars, narrow forehead and the palate and anterior teeth."

Wood Jones (328, 1934), although an opponent of any fame being accorded the specimen, states "It is much to be regretted that no measurements, illustrations or casts of this skull have ever been made available to the physical anthropologist, for, since all the circumstances of its finding point to its being a recent skull, its claims must rest on its morphological characters alone."

Shellshear (1926), Trevor (1939), Keith, by inference (1939), Clements (1939), Burkitt (1939), Davidson (1939), Mahony (1940 and 1942), Hale (1950) and other local and overseas anthropologists have expressed the need for a publication of its description.

Broom (23, 1950) points out that the Wadjak skull was kept secret for about thirty years ; the little human jaw fragment from Kedung Brubus was not described until forty years after it had been discovered ; the wonderful human skeletons found in Moravia in 1879 were never fully described and have now been destroyed ; Smith-Woodward waited ten years before publishing a short report of the Singa skull ; the British Museum received the Rhodesian skull in 1921, but a full report only appeared after seven years.

It is now twenty-six years since the Cohuna cranium was discovered and a description of it has not appeared.

For reasons presented in the text, spectrographic chemical analysis of powder from drill holes seems desirable and if mineralization is not complete, a fluorine test may be possible :

whether other human remains from the site could constitute an adequate pilot test series remains a problem.

The question of length of time required to produce warping, and finally fracture of a fully or partly mineralized cranium in silt is provocative.

More complete geological and palæontological data from bores in the region seem desirable.

Anatomically one would like a brain cast, and the problem of getting one without dividing the cranium may yet be achieved, thanks to a suggestion by Professor H. Dew, Dean of the Faculty of Medicine, Sydney.

Some 60 people, scientific and lay, have been connected with the Cohuna specimen. Whether favourably or unfavourably disposed towards it, each has contributed something to an understanding of it. The writer has endeavoured to present fully and dispassionately their contributions.

Notable points in the story are the following :

It was a layman, Terry, who made the original observation of its possible importance.

The claims made by MacKenzie, though excessive, stimulated acute controversial interest and subsequent work on the Australian aboriginal which he had stated to be one of his primary aims. The skeletal collection which is available to the Melbourne Anatomy Department stems indirectly from his original excitement ; and in any case, one has only to recall the fracas over the first Neanderthals, the Piltdown skull, *Hesperopithecus*, *Pithecanthropus*, Taungs and many other skeletal finds to realize that MacKenzie was in good company.

There are the perceptions by Burkitt in 1928 not only of the anatomical facts of the matter, both metrical and non-metrical, but also of distortion and fractures under the masking incrustations.

Then there is the transportation of the matter from the clouds back to the ground by the critical analysis and comparative data presented by Wood Jones, and the reduction of the specimen to analysable form by Shellshear's precise examination with radiography and subsequent development.

Finally, the keenness and persistence of Clements as Director to see something published deserved an earlier result.

The spiritual vicissitudes of the cranium in the controversy, polemics and fantasy of press reporting and its unhappy linkage with the Jervois specimen are equalled by its physical misfortunes. Apart from its underground experiences of earth pressure leading to distortion, and possible traumatic attack by recent aborigines and a plough-scoop, it sustained the activities of cast makers, the amputation for chemical analysis, of a valuable anatomical landmark (the inion), and a partial dislocation by water.

Originally introduced as pre-Pithecanthropian and then reduced to mediocre modernity, it seems to earn, if not deserve, a little prestige.

In any case, should it prove to be absolutely recent, it still has intrinsic worth in demonstrating persistence in present-day aborigines, of the outlandish phenotype with a more primitive morphology in massive facial skeleton and teeth, extremely narrow diameter between the temporal surfaces of the frontals, and marked dolichocephaly combined with a large cranial capacity.

Newspapers Abstracted and Abbreviations Used in Text

<i>Australasian</i>	..	..	<i>Argus</i> Newspaper, weekly.
<i>C.F.W.</i>	..	..	<i>Cohuna Farmer's Weekly</i> .
<i>C.T.</i>	..	..	<i>Canberra Times</i> .
<i>M.A.</i>	..	..	<i>Argus</i> (Melbourne daily).
<i>M.H.</i>	..	..	<i>Herald</i> (Melbourne daily).
<i>M.M.P.</i>	..	..	<i>Morning Post</i> (Melbourne daily).
<i>M.S.P.</i>	..	..	<i>Sun Pictorial</i> (Melbourne daily).
<i>S.E.N.</i>	..	..	<i>Evening News</i> (Sydney daily).
<i>S.M.H.</i>	..	..	<i>Sydney Morning Herald</i> (daily).
<i>S.R.</i>	..	..	<i>Stead's Review</i> (Melbourne monthly).
<i>S.S.</i>	..	..	<i>Sun</i> (Sydney daily).

References

- Avery and Anderson. Determination of the Mineral Content of the Cohuna Skull. Unpublished report : probably prior to December, 1926 ; now lost.
- Broom, R., 1950. *Finding the Missing Link*. London.
- Brodrick, A. H., 1948. *Early Man*. London.
- Burkitt, A. N., 1928. Unpublished noted, dated January 27, 1928.
- Burkitt, A. N., and Hunter, J. I., 1922. The Description of a Neanderthaloid Australian Skull, with Remarks on the Production of the Facial Characteristics of Australian Skulls in General. *J. Anat.*, *London*, 57 (1) : 31-54, pl. I.
- Burkitt, A. N., and Macintosh, N. W. G. *Early Man in Australia*. *Australian Encyclopædia*. 2nd Ed. (in press). Sydney.
- Campbell, T. D., 1942. A Suggested Reconstruction of the Missing Anterior Teeth of the Cohuna Specimen. *Rec. S. Aust. Mus.*, 7 (2) : 235-236, pl. VIII.
- Chapman, F., 1916. Cainozoic Geology of the Mallee and Other Victorian Bores. *Rec. Geol. Surv. Vict.*, 3 (4) : 327-430.
- Davis, J. B., 1867. *Thesaurus craniorum*. London.
- Dunn, E. J. (F.G.S.). The Geology of the Cohuna Skull. Unpublished report, 4 pp. ; probably prior to December, 1926.
- Fenner, J. F., 1941. Fossil Human Skull Fragments of Probable Pleistocene Age from Aitape, New Guinea. *Rec. S. Aust. Mus.*, 6 (4) : 335-354.
- Flower, W., 1907. *Cat. Mus. R. Col. Surg. Eng.* Part I.
- Hale, H. M., and Tindale, N. B., 1930. Notes on Some Human Remains in the Lower Murray Valley, South Australia. *Rec. S. Aust. Mus.*, 4 (2) : 145-218.
- Halford, G. B., 1878. The Crania of the Natives. In Smyth, R. Brough : *The Aborigines of Victoria*, 340-378. Melbourne.
- Hooton, E. A., 1946. *Up from the Ape*. New York.
- Jones, F. W., 1934. Contrasting Types of Australian Skulls. *J. Anat. Lond.*, 68 (3) : 323-330.
- Jones, H. G. The Dentition and Palate of Australian Fossil Man and the General Search for Primitive Features. Unpublished thesis, University of Sydney.
- Keith, A., 1931. New Discoveries Relating to the Antiquity of Man. London.
- MacKenzie, C. W., 1931. The Jervois Skull. *MANKIND*, 1 (2) : 29.
- Mahony, D. J., 1943. The Problem of Antiquity of Man in Australia. *Mem. Nat. Mus.*, Melbourne, 13 : 1-56, pls. I-III.
- Mahony, D. J., Baragwanath, W., Jones, F. W., and Kenyon, A.S., 1936. Fossil Man in the State of Victoria, Australia. *Rep. 16th Internat. Geol. Cong.*, Washington (1933), 2 : 1335-42.
- Oakley, K. P., 1949. The Fluorine-dating Method. *Yearbook Phys. Anthropol.*, 5 : 44-52.
- Tindale, N. B., 1941. The Antiquity of Man in Australia. *Aust. J. Sci.*, 3 (6) : 144-147.

N. W. G. MACINTOSH.

Polynesia : Physical Anthropology.

Graydon.

Blood Groups and the Polynesians.¹ By Dr. J. J. Graydon, *Commonwealth Serum Laboratories, Melbourne*.

The prodigious feats of navigation, whereby the Polynesians were able to reach and populate practically every inhabitable island of the vast central Pacific area, have aroused widespread admiration and no little speculation in the western world. Many centuries before Columbus these intrepid mariners set out on well-planned migrations across thousands

¹ This paper was delivered before Section F at the Brisbane meeting of A.N.Z.A.A.S. in May, 1951, and is based largely on racial blood grouping data collected by R. T. Simmons, N. M. Semple and the author with various collaborators.

of miles of landless ocean and arrived safely at their intended destinations. There is little doubt that some of these remarkable voyages must have been preceded by equally remarkable exploratory sailings.

And yet with all their navigational skill and knowledge of the heavenly bodies, they had not learnt to write and knew nothing of the wheel or of metals. In fact, they were literally a stone-age people although advanced in social organization and many arts.

Surprisingly homogeneous in language and appearance in view of the vast area of their domain, the Polynesians are physically strong and virile with high mental capacity. Their physical characteristics have usually been described as Caucasoid although Mongoloid and Melanesian characters show up in a small proportion. There is evidence indicating that in certain areas Polynesian traits have been modified by admixture with other racial elements or complexes, but these influences seem to have been somewhat localized, and do not appear to have greatly affected the main bulk of the Polynesian population at the time of the intrusion by Europeans.

Where could such a unique race have originated? By what route or routes had its ancestors reached their widely scattered realm?

These questions have been asked many times and answered in almost as many different ways. In searching for the original homeland of the Polynesian, investigators have confined their attention naturally enough to coastal areas. Various points along the Asian coast from Japan to Egypt and along the east coast of Africa and the coast of Peru have been seriously suggested at one time or another. Even a mythical lost continent in the Pacific has had its supporters.

Weckler (1943), after surveying the evidence available at that time, stated that it seemed certain that Java had once been the home of the Polynesian, but there was no substantial evidence identifying an earlier homeland. Weckler also referred to the two most popular theories which have been advanced concerning the route taken by the early Polynesians into the Pacific.

According to the first of these the Polynesians after leaving Java followed the geographically obvious route through Melanesia by which long ocean voyages were largely avoided. However evidence has been accumulating which appears to have convinced most ethnologists that the Melanesian route was not a path of these early migrations. A route through the islands of Micronesia seemed to be the only alternative to that through Melanesia. Due more to the shortcomings of the earlier theory than to weight of positive evidence in support, the Micronesian route has found great favour. According to this second theory the Polynesians left Java and sailed north-east between Borneo, Celebes and the Moluccas, passing south of the Philippines and thence along the scattered chain of Micronesian islands. On reaching the eastern end of the Carolines they embarked on long ocean voyages, either through the Marshalls to Hawaii, or more probably via the Gilbert and Ellice Islands to Samoa and the Society Islands.

Convinced that the Polynesians came to the Central Pacific islands not from the west, but from South America, Heyerdahl in 1947, with five companions, on a faithful replica of an Inca sea-going raft, made an epic crossing of the Pacific from Peru to the Society Islands. This remarkable adventure proved that Inca rafts were capable of long ocean voyages under the influence of prevailing currents and that such rafts, setting out from the Peruvian coast, would be carried by the Humboldt and south equatorial currents right to the Society Islands.

Now it is generally believed that the Society Islands were the first Polynesian homeland in the Central Pacific and that it was from there that the other island groups were colonized.

This lends weight to the theory that the Polynesians came from South America.

Avias, who was a colleague in one of our blood grouping surveys, in 1949 presented a theory of composite races to account for the peopling of the Pacific islands. In his view the Polynesians have resulted from admixture of a more or less dominant Amerind complex with an Ainoid-Negrito-Proto Melanesian complex.

Our contact with the problem arose as an offshoot from serological work connected with the intensified interest in blood transfusion during the past 10-15 years.

After developing a suspending fluid suitable for preserving blood cells and procedures for preventing deterioration during transport to our laboratory in Melbourne where such cells could be examined under favourable conditions, we commenced a series of surveys of blood group frequencies in various races of the south-western Pacific.

Briefly the procedure is as follows:

Field collaborators collect by finger or ear puncture from each individual a few drops of blood into a tiny bottle containing the anticoagulant preserving fluid. These samples after placing in ice-packed thermos flasks are forwarded by air to Melbourne, where examination proceeds immediately.

The samples are tested with a number of representative types of serum and each is classified according to the reactions obtained in the presence of sera specific for the different blood group systems.

From the observed frequencies of the serological classes it is usual to calculate the frequencies of the genes that give rise to them. In each system this reduces the number of classes needed to represent the results, which can be a very real advantage. For example the eight principal Rh genes give rise to 36 genotypes which fall into 27 serologically recognizable phenotypes. Fortunately for those calculating the gene frequencies some of the genes and many of the serological classes are extremely rare.

The surveys to date have included samplings of Australian aborigines, Maoris, Papuans and other natives of New Guinea, Admiralty Islanders, Fijians, Filipinos, Javanese and other Indonesians, Dyaks and other races of Borneo, New Caledonians, Chinese, Japanese, Malays, Marshallese, Hollanders and white Australians. Current surveys are being made of special groups including the Ainu of Japan, Negritos of the Wessel-lakes area of Dutch New Guinea, the Bainings and other tribes of New Britain, and the Kapinga-Maringi and Caroline Islanders. In some of this work we have been collaborating with Professor J. B. Birdsell of the University of California, and this association has already borne fruit, for the Ainu, the Marshallese and Carolines series were made possible through the offices of Professor Birdsell.

The main aim of the surveys has been to provide objective data by which the classification of these races on a genetic basis might be facilitated. It was hoped that the blood group frequencies so obtained would help ethnologists to resolve many controversial issues concerning the races in this area. It was not felt that blood grouping would completely supplant the older and accepted criteria of the anthropologist. In fact from the very first we have relied on the trained observer familiar with the local native population for the selection of the material for our surveys. Invariably this selection has been based on the old established visual criteria and on whatever genetic data, relating to each individual sampled, could be elucidated by questioning and from available records.

From the earlier work few inferences could be drawn because of the paucity of comparative data for neighbouring and related races. But the gaps are being filled in steadily and more information may be gleaned from each successive group studied. A similar accumulation of data will be necessary before the more recently discovered blood factors will be able to make their full contribution.

It was only natural that this blood grouping of Pacific races should have led to speculation on the intriguing problem of the migration routes of the Polynesians, who were represented in our series by the Maoris. It was thought that the Polynesians would not have passed along the islands of Melanesia or Micronesia without mixing in some degree with the natives already in occupation. Further it seemed likely that this mixing of races would be revealed by serological tests which might also provide evidence on the extent of the admixture. Appreciable admixture should be apparent in similarities of blood group frequencies.

The published data for other Polynesian groups are confined to the A, B and O system. Consequently in this paper the Maori has been regarded as the Polynesian prototype although the previously mentioned slight heterogeneity of the group should not be forgotten.

The Maoris have been examined in two separate surveys. The first was conducted in 1944 when we could determine only the A₁, A₂, B and O, M, N and Rh factors, but were not equipped to distinguish the Rh types, the S subdivisions, certain gene variants, secretor status, the Lewis blood group and the taste reactions to phenyl thiocarbamide, all of which were covered in the second survey.

In the earlier investigation we found no evidence to support the Melanesian theory but could make no helpful Micronesian comparisons. In the intervening years much relevant data has accumulated and it is now possible to review the theories outlined earlier with greater factual backing.

The extent of this newly acquired data can be gauged from Table I, in which blood gene frequencies for various human populations of Oceania are presented. A few continental peoples have been included for comparison.

Only the most comprehensive surveys available for each population have been given in order to keep the table to a reasonable length. Even with this restriction the bringing together of data for so many of the blood group systems has produced a rather cumbersome table.

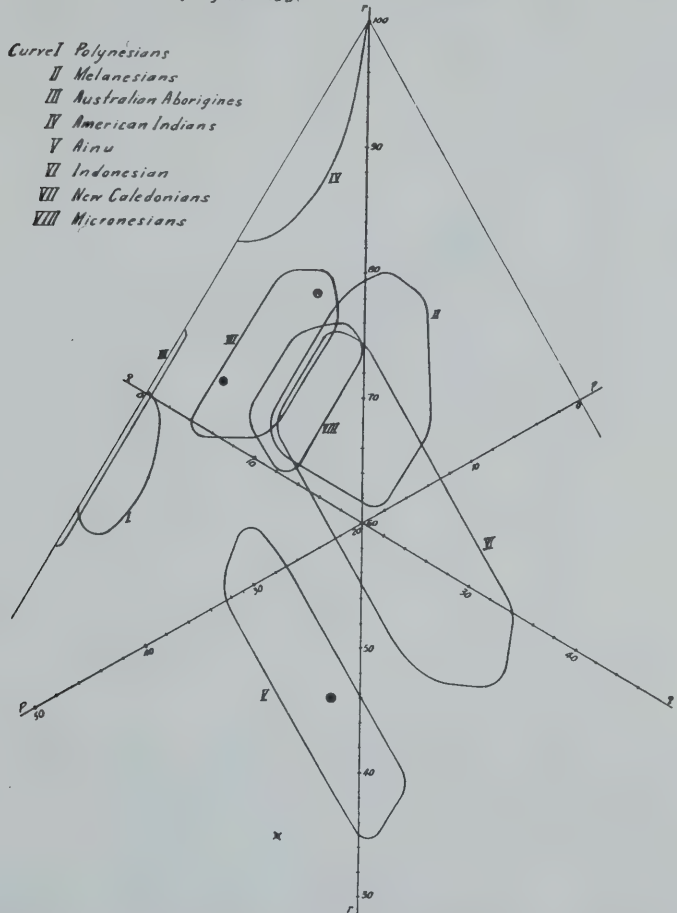
For an exhaustive list of the racial blood grouping data published up to 1939 the reader is referred to the monumental compilation by Boyd in *Tabulae Biologicae* of that year. It is understood that steps are being taken to bring this work up to date and to extend it to cover some of the "newer" blood group systems.

As a visual aid to interpretation the A-B-O data have been plotted using triangular co-ordinates as first suggested for this purpose by Streng in 1926. In Figure 1, which is a slight modification of that of Avias, 1949, the plot points are not shown, but only areas bounding the points obtained for the several surveys in each racial group.

Obviously there is some overlapping, but there is also a striking segregation which is more or less into groups.

Much can be inferred by close study of such a figure, but for the present purpose it is sufficient to note that the Polynesian, American Indians and Australian aborigines occupy areas which hug closely the line of zero B. On the contrary the Melanesian, Indonesian and Micronesian figures lie in areas extending from average to high B. The New Caledonians,

FIG. I- A, B, O BLOOD GROUP GENE FREQUENCIES IN VARIOUS RACES
AFTER AVIAS (1949) MODIFIED.

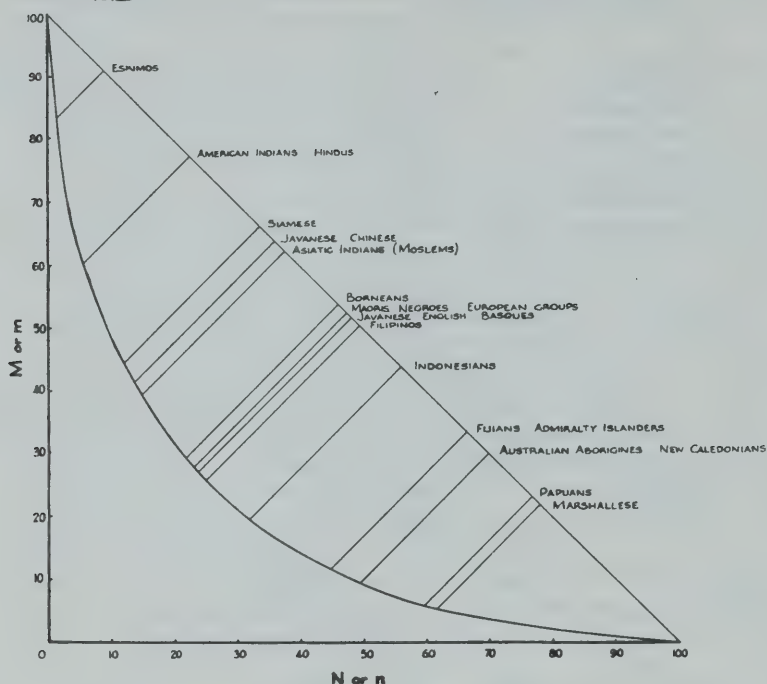


who have Melanesian, Polynesian and Australoid elements, lie in the area just where such a group would be expected—between the areas occupied by the component groups. Clearly, the Polynesian is closer to the American Indian than to either the Melanesian or Micronesian in respect of A, B, O groups. Our tests have shown the sub-groups A_2 and A_2B to be absent from all the Pacific races so far examined. Because this interesting finding contributes nothing to the elucidation of the present problem it has not been referred to in Table I.

A diagrammatic summary of relevant M, N frequencies is given in Figure 2, which is similar to that used by Avias, 1949, and many others earlier.

The Maoris are believed to possess a Melanesian element which is more evident than elsewhere in Polynesia with the exception of Samoa, where trade with Melanesian Fiji has been carried on for centuries. If the Polynesians are closely related to the Amerinds, we would expect to find their position in Figure 2 to be intermediate between those of the American Indians and the Melanesians, and this is the case.

FIG II M N FREQUENCIES IN VARIOUS RACES



Again one can find nothing to favour either the Melanesian or Micronesian routes, for the M, N frequencies in Melanesia and Micronesia are similar yet quite unlike those in the Maoris. When opportunity offers we hope to test other Polynesian groups, and it might be expected that the frequency of *m* will be higher than in the Maoris.

It is unfortunate that there are no Amerind figures available for the S (Sydney) subdivisions of the M, N types. These give promise of great usefulness in resolving racial differences as brief reference to the frequencies observed in Australian aborigines and the natives of New Guinea shows. The M, N distributions of these groups are fairly similar, but tests with anti-S serum indicate that S+ individuals do not exist amongst the Australians but are relatively common in New Guinea. Thus the use of S serum has provided clear-cut distinctions between these populations when tests with M and N sera were inconclusive.

We will have to await the compilation of further S data before we can say which of the theories under consideration is favoured by such tests. The S distributions for Maori, Melanesian and Micronesian groups have been determined, but these add little to the differences already revealed in the M, N figures (see Table I).

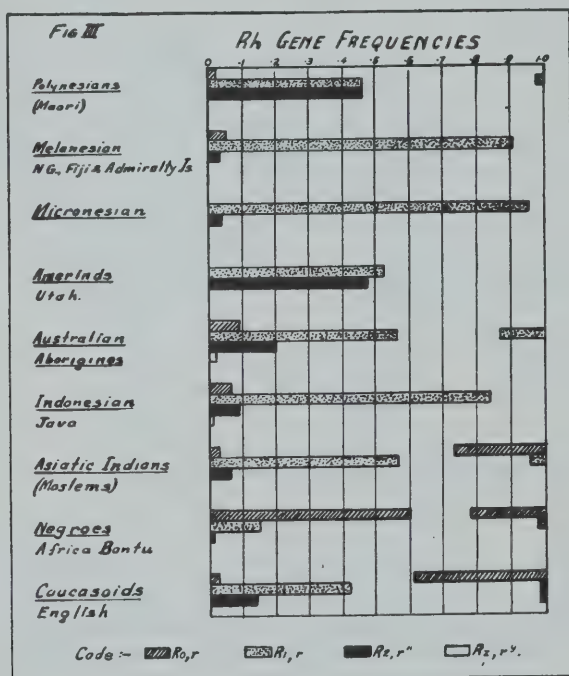
Some of the Rh gene frequencies of Table I have been presented in different form in Figure 3.

The so-called Rh-positive genes, i.e. those containing the elementary gene D of Fisher, have been placed to the left of the chart; the Rh-negative genes—those lacking D—are to the right.

TABLE I
Blood Gene Frequencies in Various Populations

Population.	A, B, O.			M, N, S.						Rh.						P. P.	Lewis. Le ^a Gene.
	A.	B.	O.	m.	n.	ms.	ns.	πs.	πs.	R ₀ cDe.	R ₁ CDe.	R ₂ CDe.	r cde.	r' Cde.	r' cde.		
I. Maoris (6, 23)	0.338	—	0.662	0.525	0.475	0.014	0.500	0.438	0.027	0.465	0.486	—	—	0.022	—	0.68	0.55
Hawaiians (2)	0.382	0.018	0.604	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Samoaans (2)	0.103	0.118	0.766	—	—	—	—	—	—	—	—	—	—	—	—	—	—
II. Fijians (18)	0.225	0.120	0.660	0.332	0.667	—	—	—	0.110	0.840	0.050	—	—	—	—	—	—
Admiralty Islanders (18)	0.146	0.136	0.720	0.339	0.661	—	—	—	0.030	0.940	0.030	—	—	—	—	—	—
"Papuaans," N.G. Natives (5, 14, 17)	0.215	0.127	0.674	0.227	0.773	0.032	0.149	0.715	0.021	0.943	0.020	0.016	—	—	—	—	—
III. Australian Aborigines (14, 19)	0.251	—	0.749	0.297	0.703	—	0.256	0.744	0.085	0.564	0.201	0.021	—	0.129	—	—	—
IV. American Indians, Ute (10)	0.011	—	0.989	0.76	0.24	—	—	—	?	0.524	0.476	—	—	—	—	—	—
American Indians, Mexico (27)	0.031	0.016	0.953	0.79	0.21	—	—	—	0.06	0.64	0.27	0.03	—	—	—	0.54	—
VI. Javanese (22)	0.178	0.180	0.642	0.632	0.368	—	—	—	0.065	0.837	0.086	0.012	—	—	—	—	—
Other Indonesians (22)	0.130	0.133	0.737	0.435	0.565	—	—	—	0.04	0.81	0.13	0.02	—	—	—	—	—
Natives of Borneo (7)	0.210	0.195	0.591	0.542	0.458	0.03	0.48	0.46	0.039	0.873	0.079	0.009	—	—	—	0.50	0.41
Filipinos (16)	0.152	0.181	0.671	0.510	0.490	—	—	—	0.03	0.88	0.08	0.01	—	—	—	—	—
VII. New Caledonians (20)	0.204	0.059	0.731	0.297	0.703	—	—	—	0.054	0.833	0.107	0.004	—	—	—	—	—
VIII. Marshallese (24)	0.135	0.134	0.723	0.222	0.778	—	0.234	0.115	0.006	0.952	0.042	—	—	—	—	0.55	0.51
Indians, Asiatic (Moslems) (26)	0.185	0.261	0.583	0.622	0.378	0.288	0.312	0.060	0.034	0.562	0.060	—	0.266	0.044	—	—	—
Siamese (12)	0.148	0.257	0.595	0.662	0.338	—	—	—	0.111	0.755	0.112	0.022	—	—	—	—	—
Chinese (20)	0.165	0.139	0.681	0.630	0.370	—	—	—	0.040	0.760	0.195	0.005	—	—	—	—	—
Japanese (5, 11)	0.274	0.176	0.543	0.540	0.460	—	—	—	—	0.702	0.277	—	0.02	—	—	—	—
Negroes, Bantu (Africa) (15)	0.190	0.132	0.678	0.525	0.475	—	—	—	0.704	0.072	0.059	0.016	0.119	0.029	0.001	0.636	—
Pygmies, Bantu (Africa) (9)	—	—	—	—	—	—	—	—	0.638	0.062	0.195	—	0.105	—	—	—	—
Caucasians, English (13)	0.279	0.061	0.660	0.535	0.465	0.256	0.279	0.074	0.026	0.420	0.141	0.002	0.389	0.010	0.012	—	0.47
Caucasians, Basques (3)	0.256	0.026	0.717	0.538	0.462	—	—	—	0.005	0.376	0.071	—	0.532	0.015	0.002	—	—

Where the gene frequencies are very low, chance plays a big part in whether or not they will be detected in a series of tests. Consequently arguments based on comparisons of very low gene frequencies must be treated with reserve. But the frequencies of the common genes which in this part of the world are R_1 and R_2 carry far greater weight as they are subject to much less statistical error. Particular attention should be paid to these genes, though appreciable frequencies of other genes should not be neglected.



In the figure it is apparent that the pictures presented by the Maoris and the American Indians are strikingly similar and both are remarkably unlike those of the Melanesians and the Micronesians.

The frequency of gene R^1 is much lower and of R^2 much higher in the Polynesians and Amerinds than in the Melanesians and Micronesians. This offers further strong serological argument in favour of an affinity between the former pair.

There is therefore no serological justification for the lumping together of these two races into a common major human classification.

The serological differences to which attention has been drawn are major ones—all supporting the hypothesis of a Polynesian-Amerind relationship and at the same time sharply distinguishing the Polynesian from the Melanesian and Micronesian. Equally well-defined differences could be drawn between our Maori group and the Indonesians or with any other race listed in the table.

TABLE II.

Blood Group System.	Melanesian.	African Negro.
A, B, O	A ₂ absent	$\frac{A_2}{A_1}$ ratio highest yet found
M, N	$m = 0.3$	$m = 0.5$
Rh	$R_0 = 0.1$	$R_0 = 0.6$
	$R_1 = 0.9$	$R_1 = 0.15$
	r absent	$r = 0.22$

It is therefore logical to assume that the Polynesians and the Amerinds belong to the same racial class and have similar major components. They have of course some differing minor elements such as the undoubted Melanesian revealed in the Samoan and occasionally in the Maori.

The gene R_0 is absent or of low frequency in all four groups which is in marked contrast to the high frequency observed in African Negroes.

Though not pertinent to the problem under consideration, I feel I cannot let this opportunity pass to draw attention to the wide serological gulf between the Oceanic Negroes as represented by the Melanesians and the African Negroes. Major points of difference have been observed in each blood group system for which comparative figures are available. These are indicated in Table II.

Now the Polynesians are comparatively recent settlers in their Pacific homelands. In fact their arrival in the central Pacific is generally believed to have been at a time when the cultural development in the lands of South-east Asia was more advanced than their own. It seems that if the Polynesians came from that area they must have left a long time before their arrival in central Polynesia. In this case they would surely have left much evidence of their protracted stays in the intervening islands and one would expect racial admixture to be apparent.

There is certainly evidence that Polynesians have been at some time in parts of Melanesia and Micronesia but collectively that evidence hardly seems strong enough to be indicative of a long stay in those areas. Nor does it show convincing preference for either Melanesia or Micronesia as the probable path of the ancestors of the Polynesian. Further, much of the evidence so far produced could be explained equally well by a westward migration from Polynesia.

The blood grouping figures favour neither Melanesia nor Micronesia. If no other facts were known they would almost compel one to look for another alternative. And the only obvious alternative, the very long landless ocean path from America, gains strong support from blood gene frequencies.

The serological similarity of these two groups which is not unsupported by likenesses in other criteria suggests that the Polynesian and the Amerind have a common dominant component. Further, this component, perhaps somewhat differentiated during centuries in the widely diverse environments of the Americas, could have reached Oceania at any time with the aid of prevailing ocean currents. That ocean currents have had a major influence on the migratory journeyings of the Polynesian has gained much support in recent years following the successful enterprise of Heyerdahl and the involuntary voyages of two other groups quoted by Avias, 1949.

These three remarkable ocean voyages took place within a space of twelve months. How many similar sailings have taken place over the centuries we have no idea, but we know that long ocean voyages taking advantage of ocean currents and prevailing winds were well within the capabilities of the seafaring early Polynesian.

Avias (1949) has suggested that the Polynesian has resulted from admixture of an Amerind component with a proto-Melanesian group which had arrived in Polynesia before the Amerinds. He described the latter group as a negrito-ainoid complex with possibly a dash of Papuan. Our results suggest that the proto-Melanesian component must be weak in Polynesia, as it has left little serological evidence of its presence in the Maoris.

Nevertheless there appears to be much to indicate that another race reached some of the islands of Polynesia.

This group, though perhaps outnumbered by the "Amerinds," may well have been responsible for some of the similarities of culture and language that have been quoted in support of an eastward course for the Polynesian. It is also likely that since his original settlement in the central Pacific the Polynesian has, on occasion, driven westward into both Melanesian and Micronesian territories and possibly even into Indonesia.

In conclusion it is submitted that the serological evidence presented in this paper strongly supports a Polynesian-Amerind relationship, making it probable that the islands of Polynesia have been settled largely by migrations from continental America. Prevailing ocean currents and other factors suggest the coast of Peru as the starting point of such migrations.

The suggestion that the Polynesian possesses a second component derived from peoples of the western Pacific islands would account for similarities in culture and language that have been reported in Melanesia, Micronesia and Polynesia.

As a future project the determination of S and "Duffy" distributions in relevant racial groups may provide evidence of great importance, for Pantin and Janquerra (1951) report a difference of 100% in the frequency of Duffy, $F_y(a_+)$ between Mongoloids (Chinese) and Brazilian Indians.

BIBLIOGRAPHY

1. Avias, J., 1949. "Les Groupes Sanguins des Néo-Calédoniens (A, B, O, M, N, Rh) et des Océaniens en Général du Point de Vue de l'Anthropologie Raciale." *L'Anthropologie*, Volume 53, 1949, page 209.
2. Boyd, W. C., 1939. "Blood Groups." *Tabulae Biologicae*, Volume XVII, 2, page 113.
3. Chalmers, J. N. M., Ikin, E. W., and Mourant, A. E., 1949. "The ABO, MN and Rh Blood Groups of the Basque People." *American Journal of Physical Anthropology*, Volume 7, New Series, page 529.
4. Graydon, J. J., and Simmons, R. T., 1945. "Blood Groups in the Territory of Papua." *The Medical Journal of Australia*, Volume II, page 77.
5. Graydon, J. J., Simmons, R. T., Heydon, G. M., and Bearup, A. J., 1945. "The Rh Factor and Blood Groups in Japanese." *The Medical Journal of Australia*, Volume I, page 601.
6. Graydon, J. J., Simmons, R. T., Dixon, C. W., Lonie, T. C., Maaka, G. H., and Bridgman, E. H., 1946. "Blood Groups in the Maori." *The Medical Journal of Australia*, Volume I, page 135.
7. Graydon, J. J., Simmons, R. T., Clapham, L. J., Wallace, E. H., and Harrison, Tom. "Blood Genetics of Various Populations in Borneo." *The Medical Journal of Australia*. (In press.)
8. Heyerdahl, T., 1950. "The Kon-Tiki Expedition." Translated by F. H. Lyon. George Allen and Unwin Ltd., London.
9. Hubinont, P. O., and Snoeck, J., 1949. "Répartition des Gènes Rh (CDE cde) Chez les Pygmées Batswa des Ntomba." *Comptes Rendus des Séances de la Société de Biologie*, Volume 143, page 579.
10. Matson, G. Albin, and Piper, C. L., 1947. "Distribution of the Blood Groups, M-N, Rh Types and Secretors among the Ute Indians of Utah." *American Journal of Physical Anthropology*, Volume 5, N.S., page 357.
11. Miller, E. B., and Taguchi, T., 1945. "Distribution of the Blood Groups, Sub-groups and Rh Blood Types in Japanese." *The Journal of Immunology*, Volume LI, page 227.
12. Phansomboon, S., Ikin, E. W., and Mourant, A. E., 1949. "The ABO, Rh and MN Blood Groups of the Siamese." *The American Journal of Physical Anthropology*, Volume VII, N.S., page 563.

13. Race, R. R., Mourant, A. E., Lawler, S. D., and Sanger, Ruth, 1948. "The Rh Chromosome Frequencies in England." *Blood*, Volume 3, page 689.
14. Sanger, Ruth, 1950. "The M N S Blood Groups of Australian Aborigines and New Guinea Natives." *Nature*, June 10, page 939.
15. Shapiro, M., 1951. "The ABO, MN, P and Rh Blood Group Systems in the South African Bantu. A Genetic Study." *South African Medical Journal*, Volume 25, page 165.
16. Simmons, R. T., and Graydon, J. J., 1945. "Blood Groups, Sub-groups M, N Types and Rh Subtypes in Filipinos." *The Medical Journal of Australia*, Volume II, page 325.
17. Simmons, R. T., Graydon, J. J., Woods, E. F., Hugh Smith, W. A., and Lancaster, H. O., 1946. "Further Observations on the Rh and Hr Factors and the Blood Group Frequencies in Papuans." *The Medical Journal of Australia*, Volume I, page 537.
18. Simmons, R. T., and Graydon, J. J., 1947. "Blood Group Frequencies in Admiralty Islanders: Further Observations on the Fijians and Indonesians and on Rh Gene Frequencies in Some Other Races." *The Medical Journal of Australia*, Volume I, page 577.
19. Simmons, R. T., and Graydon, J. J., 1948. "The Rh Blood Types in Australian Aborigines." *The Medical Journal of Australia*, Volume II, page 113.
20. Simmons, R. T., Graydon, J. J., and Avias, J., 1949. "Blood Groups, M-N Type and Rh Type Frequencies in New Caledonians and the Loyalty and Pine Islanders." *The Medical Journal of Australia*, Volume I, page 733.
21. Simmons, R. T., Graydon, J. J., Semple, N. M., and Green, R., 1950. "The A₁-A₂-B-O, M-N and Rh Blood Groups in Southern Chinese: Hakkas, Cantonese and Hokkiens." *The Medical Journal of Australia*, Volume II, page 917.
22. Simmons, R. T., and Graydon, J. J., 1951. "A Comparison of the Blood Groups, Subgroups, M-N and Rh Types Found in Java with Those Found in Other Parts of Indonesia, Together with a Summary of the Evidence for North-South Gradients in the Values for the Blood Genes *g*, *m* and *R*¹." *The Medical Journal of Australia*, Volume I, page 173.
23. Simmons, R. T., Graydon, J. J., Semple, N. M., and Taylor, C. N. Derek, 1951. "Blood Taste and Secretion: A Genetical Survey in Maoris." *The Medical Journal of Australia*, Volume I, page 425.
24. Simmons, R. T., Graydon, J. J., Semple, N. M., Milbourne, J. D., Lee, J. R., *et alii*, 1951. "A Collaborative Genetical Survey in Marshall Islanders: Micronesia." *The American Journal of Physical Anthropology*. (In press.)
25. Weckler, J. R., 1943. "Polynesians—Explorers of the Pacific." *Smithsonian Institution War Background Studies*, Number 6, January 13.
26. Wiener, A. S., Sonn, E. B., and Belkin, R. B., 1945. "Distribution and Heredity of the Human Blood Properties, A, B, M, N, P and Rh." *Journal of Immunology*, Volume 50, page 341.
27. Wiener, A. S., Zepeda, J. P., Sonn, Eve B., and Polivka, H. R., 1945. "Individual Blood Differences in Mexican Indians, with Special Reference to the Rh Blood Types and Hr Factor." *The Journal of Experimental Medicine*, Volume 81, page 559.

J. J. GRAYDON.

Australia : Material Culture.

Campbell and Walsh.

Aboriginal Implements from Camp Sites in the South of South Australia and Victoria.
By Dr. T. D. Campbell and Miss G. D. Walsh.

In April of 1947, during a vacation trip, the writers collected implements on brief visits to a number of camp sites in the south-east of South Australia and in several places in Victoria. In most instances, only the smaller examples of implements were collected on account of limited transport facilities.

The following notes briefly describe the locations of the sites and a classification of the material collected.

(1) This small but interesting site was found near the Cave Range and about fourteen miles west of Penola, South Australia. It consists of a small blown sand-ridge near Cave Range in Section 22I, Hundred of Monbulla. This is a well timbered district with fresh-water swamps in the vicinity. Its main interest is in the fact that Cave Range is the farthest inland main ridge of the notable south-eastern series of parallel consolidated dunes and is some distance from the coastal ridges which provide large numbers of camp site remnants. At this site, in the short time available, an interesting collection of small implements was made. All are of flint; a material which had been derived either from one of the adjacent consolidated limestone ridges or may have been transported from a coastal source of supply.

Micro size (101).

Points : Woakwine forms, 35 (mostly poor forms) ; abrupt trimmed, 4 ; Bondi, 16.

Segments : ordinary, 16 ; rudder, 2. Trapezes, 5.

Triangles, 1.

Scrapers : side, 5 ; double side, 2 ; end, 2 ; nosed, 2 ; semi-discoïd, 3 ; tula flake, 6 ; pyramidal discoïd biface trimmed, 2.

Larger specimens (17).

Scrapers : side, 7 ; double side, 4 ; nosed, 1 ; concave, 4. One quartz percutor.

Total, 118.

(2) A series of sandhills, locally known as Hood's Drift, occurs on the east side of the Hundred of Kongorong (in Section 541). Here is abundant evidence of intensive Aboriginal occupation. On the north-eastern slopes, sheltered from the prevailing south-westerly winds, are extensive blown areas presenting vast quantities of implements and implement débris. The site is strikingly situated, as the hills give a wide outlook over most of the surrounding country. There is evidence that the region was well timbered in years past and water supplies lie within easy reach. It has previously been an attraction to other collectors who have gathered material from the site. Mitchell (1943) has published a brief description, with photographs, of part of the drift area.¹ In the few hours permitted for our collecting, an interesting set of implements was gathered, including a fine assortment of micro forms. All the implements from this site—with the exception of the granitic hammer stones—are of the typical flint which occurs on the adjacent coastal margin in a vast, unlimited supply of raw material. Out of the total of over 200 implements, only about a dozen present a relatively fresh, broken surface ; otherwise, all have the yellow-brown " patination " which is typical of the implements previously gathered by us and by other collectors who have worked on the many inland sites of this Kongorong region.

Microliths (105).

Points : Woakwine, 29 ; Bondi, 7 ; also 18 broken or poorly shaped Bondi.

Segments : ordinary, 26 ; narrow, 2 ; rudder, 1.

Triangles : scalene, 4. Trapezes, 8.

Scrapers : side, 8 ; carinate, 2.

Larger implements (139).

Scrapers : casual, 16 ; nosed, 4 ; semi-discoïd, 14 ; tula flake, 10 ; concave, 6 ; end, 10 ; end with side trimming, 9 ; end with double side trimming, 7 ; side, 32 ; double side, 14.

Knives (flake), 7.

One large flake (15 cm. $\times$ 11 cm.) with end and side trimming. Seven large (approx. 10 cm. $\times$ 7 cm.) trimmed flakes of the cleaver type. Two percutors.

Total, 244.

(3) Mt. Gambier. This small site occurs on the south hillside above Valley Lake.

Micro forms (31).

Segments, 4. Elouera, 1.

Points : Woakwine, 1 (broken) ; crudely trimmed forms, 13.

Scrapers : end, 5 ; side, 7.

¹ Mitchell, S. R., " Geology and Ethnology of the Kangorong Hills, South Australia," *Vict. Naturalist*, LX, 59-62, 1943.

Larger forms (14).

Scrapers : end, 2 ; side, 9 ; concave, 1 ; semi-discoid, 1. Crudely trimmed point, 1. All these implements are of flint.

Total, 45.

(4) An extensive sandhill area near the Victorian border ; in Section 258, Hundred of Gambier. No implements of micro size were found here. All are of flint.

Scrapers : side, 4 ; end with side trimming, 6 ; concave, 1 ; nosed, 2 ; coroid, 1 ; tula like, 1. One irregular shaped trimmed point.

Total, 16.

(5) Cape Bridgewater, west of Portland, Victoria. This area is a denuded sand-blown site on the cliff tops. No micro forms were collected ; all implements are of flint.

Scrapers : end, 3 ; side, 1 ; double side, 2 ; double concave, 2 ; semi-discoid, 5.

Total, 13.

(6) Lake Lonsdale, near Stawell, Victoria. This small sandhill area is situated on the north-west side of the lake and has been intensively examined by Victorian collectors for many years. With the exception of one large implement, all the specimens gathered are of micro size. The materials concerned are quartzite, and indurated claystone ; a few examples are of quartz.

Micros (77).

Segments : ordinary, 12 ; rudder, 6.

Trapezes, 11. Triangles : scalene, 4 ; equilateral, 2.

Points : Bondi, 10 ; Woakwine, 10 ; abrupt trimmed, 7 ; broad leaf shape, 2.

Scrapers : side, 4 ; end, 2 ; thumbnail, 3 ; discoid, 1 ; semi-discoid, 1 ; tula like, 2.

One large trimmed casual scraper.

Total, 78.

(7) Point Cook, Port Phillip Bay. The area visited is one of wind-blown sites near the shore line and north of the aerodrome. These sites have been continuously examined by Victorian collectors for many years ; but apparently they continue to offer occasional specimens for the patient searcher.

All the specimens collected (92) here are of micro size and most were made from either quartzite or chert ; a few are of quartz.

Segments : ordinary, 23 ; rudder, 8. Trapezes, 9. Triangles, 8.

Discoidal, 1 ; semi-discoid, 2 ; thumbnail, 10 ; biface trimmed discoid, 1.

Points : abrupt trimmed, 10 (mostly poor or broken) ; Woakwine type, 12 (poor forms) ;

Bondi form, 2 (poor forms).

Scrapers : side, 1 ; end, 1. Nuclei : conical, 2 ; prismatic, 2.

Also collected : a half portion of a small basaltic polished edge axe-head.

Total, 93.

The census of the above collection of implements shows a preponderance of micro forms—406 against 201 of the larger forms. Possibly this is mainly due to the circumstances of our transport and collecting, together with a special interest of the writers in the smaller types of implement.

Although the collection is not numerically large, on account of its being incidental to a touring vacation, it does present several points of interest to add to the observations previously gathered through extensive collecting by the writers, and others in these southern

areas. The Aborigines of the southernmost part of South Australia and of western Victoria—which are closely related natural geographical regions—were obviously intimately acquainted with and expert in fashioning, a wide variety of microlithic forms.

The collection from the inland site near Penola is of special interest in several ways. It provides evidence of definite, if not numerous, occurrences of some of the micro forms which are characteristic of the coastal regions of the lower south-east of South Australia. It also brings their occurrence to a more northerly extension for this region than has been appreciated before. These particular specimens are of poorer quality than is typical of the coastal sites. In the absence of local supplies, flint in this area may have been brought about fifty miles from the abundant coastal flint sources.

Previous extensive collection in the Hundred of Kongorong (Campbell, Cleland, Hossfeld) indicated² that for this area of camp sites microlithic forms were far more abundant on the littoral than on the inland sites. But our brief visit to Hood's Drift (and from the so far unpublished results of subsequent collecting at this same site early in 1948) shows that at least for this large camp area microliths occur in appreciable numbers. The specimens showed the marked preponderance of yellow-brown stained implements—a feature which is no doubt due to soil chemistry and possibly an age factor.

The gathering of mostly micro forms on the Victorian sites visited supports the evidence previously gained by Victorian workers that the same forms occur there as on the neighbouring South Australian areas. Also that the same micro forms were made from materials other than flint—the typical raw material of the South Australian sites. The fact that such intensively examined sites like those of Lake Lonsdale and Point Cook can still produce a useful “picking” of these micro implements, indicates either the abundance of manufacture or long-standing usage of these small forms.

The collection here described is not large; but it is felt the descriptions will provide a useful detailed record. The importance of intensive examination of properly recorded camp sites, careful classification of implements with accepted terminology, and the provision of census results cannot be emphasized too strongly, for it is only by the amassing of such evidence in its geographical extensions that knowledge of the use and importance of archaeological material can be safely assessed.

T. D. CAMPBELL.

G. D. WALSH.

REVIEWS :

South Pacific Commission, Project S.10, Report No. 1 : Some Notes and Suggestions Regarding Conservation of Important Archaeological Sites and Objects in South Pacific Territories. By Felix M. Keesing. 1951. 8 and xiii pp. 5/-.

This report, which deals with the recording and preservation of archaeological sites, historic monuments and archives in the South Pacific, forms an excellent basis for the objects of the project. Mr. H. E. Maude, the Member for Social Development of the Research Council of the Commission, makes an appeal for co-operation and support from the various administrations and scientific societies in the region.

Dr. Keesing, Professor of Anthropology at Stanford University, gives an interesting outline of the possibilities of archaeology as a science for both professional and amateur

² Campbell, T. D., Cleland, J. B., and Hossfeld, P. S., “Aborigines of the Lower South-east of South Australia,” *Rec. Sth. Aust. Mus.*, VIII, No. 3, 1946, 445-502.

workers in the South Pacific, and of the intriguing story of human migrations and cultural development that the Pacific possesses and will yield to the archæologist in the future. He stresses the need for the use of skilled and accurate methods in exploring archæological sites, makes constructive suggestions for the protection and handling of known finds, including the need for island museums to display archæological materials, and the story behind them. A list of institutions to be notified of new archæological discoveries is given, and an excellent bibliography of the subject is provided.

The literature on the movements of peoples in the South Pacific is extensive and interesting, even though it consists mostly of hypotheses and conjectures based on similarities of words and customs, on myths, art and other traits, but it reveals the tremendous interest of scientists and people throughout the world in such matters, particularly since the Kon-Tiki Expedition's stimulus. Any relics, therefore, which will throw light on this problem should be preserved, and as Dr. Keesing quite rightly says, the onus of responsibility to preserve the archæological sites and specimens in the Pacific Islands—for local residents, both native and otherwise, and for visitors and students—lies with local administrations, some of whom have already enacted protective legislation and have set up collections of the material. It is to be sincerely hoped that the South Pacific Commission will receive full and active support everywhere in this admirable project.

F. D. McCARTHY.

Lamet, Hill Peasants in French Indo-China. By K. G. Izikowitz. *Etnologiska Studier*, No. 17, 1951, 375 pp., 129 figs. Goteborg.

This monograph describes the Lamet people and their environment, their villages and buildings, social organization and government, technology, food collecting and cultivation, stock raising, economic life, use of resources and trade, cultural drives, and social changes. The Lamet cultivate rice and other crops in a shifting agricultural economy and raise buffaloes, pigs, poultry and bees. In addition, they utilize many plant foods growing in the forests and are expert hunters and fishermen, but these sources of food fit into a seasonal sequence with their cultivated products. Buffaloes and bronze drums constitute their principal objects of wealth. Many of the magical formulas connected with various stages of the crops are given in the very interesting chapter on agriculture. The interest of the Lamet to the student of Melanesia and Polynesia lies in the similar economic patterns of life common to each group. The technologist will be interested in the similarity of the range of fish and animal traps and snares employed by the Lamet to those of Indonesia and Melanesia.

F. D. McCARTHY.

CORRESPONDENCE, NOTES AND NEWS :

The Rock Paintings near Glen Isla, Victoria Range, Victoria.

Sir,

In the *University of Melbourne Gazette*, Vol. VI, No. 10, of December 14th, 1950, pp. 96 f., I published a brief preliminary report on the Melbourne University Excursion to Glen Isla, which took place from

October 23rd to October 27th, 1950. Published in a university gazette, the article naturally could not reach those whom it really concerned, viz. the small community of ethnologists and archaeologists in Australia, but also the permanently increasing circle of students of primitive art. It is intended to visit the Glen Isla rock again

when more photographs and drawings will be taken. The wall has already been photographed in colour, but photographs and water-colour sketches so far have been taken of single groups and figures only. When an accurate complete copy of the whole wall is made with the help of an auxiliary network of squares, we shall be able to illustrate the rock paintings as they actually are and, especially, in the order and arrangement in which they actually appear. For, as has been pointed out in the preliminary article, the main result of our examination is that the lithograph published by the Rev. John Mathew (the author of "Eaglehawk and Crow"), with his paper "Note on Aboriginal Rock Painting in the Victoria Range, County of Dundas, Victoria," in the Proceedings of the Royal Society of Victoria, 1896, is not reliable in that the arrangement and order, also some details of the figures, *are not as illustrated by Mathew but largely different*. It is important to make this known now, even before a correct copy is available, so as to warn students, lecturers and authors in Australia and abroad to use Mathew's reproduction only very cautiously. Many details are fairly well reproduced by Mathew, but without first-hand knowledge of the actual paintings it is difficult even to use those reliable details. The paintings must have faded considerably since Mathew's time. Our criticism of his reproduction, however, concerns facts which have nothing to do with the fading. Consequently, the reproduction after Mathew in Prof. D. S. Davidson's "Aboriginal Australian and Tasmanian Rock Carvings and Paintings," as well as F. D. McCarthy's identical reproduction in the *Australian Museum Magazine*, June, 1939, are subjected to the same criticism. Likewise, the two first paragraphs of W. J. Walton's article in MANKIND, Vol. 2, No. 4, p. 96 (June, 1937) refer to paintings which, in the form and

arrangement *bona fide* indicated by Walton, do not really exist. Just a few corrections may already be given at this stage: Mathew observes frankly that he did not reproduce all the little strokes apparently representing vegetation. But he claims "Those I have given show how thickly they are distributed and their relative length and positions." Actually this is not so. Mathew's lithograph, which is not based on a photograph but Mathew's own drawings, gives no idea of the surprising quantity and arrangement of innumerable little vertical strokes over a large proportion of the rock wall. Whether this is a point of major or minor importance it is still too early to decide. The position of most figures on the wall differs from that given by Mathew. Other figures are drawn inaccurately. For instance, the large figure No. 20 on the left-hand side of Mathew's picture does not exist. But a striking large figure, which might have been misrepresented in a sketch from memory, exists in the lower right-hand corner of the rock wall. The group No. 14 is well done, also its position is fairly correct, although it is actually a little higher up on the wall. But then the lithograph gives no idea of the actual contours and proportions of the painted area in comparison with the surrounding plain rock. The animals Nos. 8 and 9 in the upper right-hand of Mathew's picture are actually rather in the upper region of the centre.

That an author of the standing of Mathews could reproduce such an inaccurate illustration may perhaps be explained in this way: Mathew obviously had no camera at his disposal, so he had to rely on drawings. As the picture, or rather the painted rock surface, is large enough to make it extremely difficult to draw a complete copy of the whole surface, Mathew had to be content with copying single figures piecemeal. These he marked with numbers, hoping to put them together at home.

The numbers in his reproduction show that he failed to put the fragments together in their actual order, while other details in the lithograph have no number at all. It is regrettable, therefore, that Mathew did not mention the technical procedure by which he obtained his picture and that he did not explain that only single figures and groups, but not the whole composition (if there is a composition), can be used for scientific reference.

LEONHARD ADAM.

Department of History,

The University of Melbourne.

Pecked-marked Carvings and Sign-talk.

Sir :

During the month of November 1951, I was the guest of Mr. and Mrs. Waudby of Mount Wedge cattle station, situated on the Stuart Bluff Range about 170 miles N.W. of Alice Springs.

Whilst there, Mr. Waudby took me out in his utility to see some paintings and pecked-marked carvings he had recently found, and with us was an old Aboriginal called One Pound Jimmy.

Our first stop was at a place called Adjumberri, and under a ledge of quartzite, beside a dry rock-hole, Jimmy showed us some paintings and very faint pecked-marked carvings that records this place as a "Possum dreaming."

As Jimmy showed us these pecked-marked carvings, he made a sign-talk with his hand for the Possum, and it was interesting to see that the sign-talk and the engraving were similar, and near-by, as if to confirm this thing, was similar painted "abstract art" of the possum with the tracks of the animal beside the painting.

As an illustration, the pecked carvings were one circle with another one nearly around the inner one, and the sign-talk of the possum made by Jimmy was the middle

finger and thumb joined in a circle with the index finger curved as part of the outer circle. The inner circle, Jimmy explained, "was the belly and fat," apparently the animal was cooked, "and the outer part-circle was the tail."

As if to confirm this relationship of the abstract art to sign-talk, we went to "Kumalba" (Emu Spring) west of Central Mount Wedge, and at this "Woman dreaming," relating to the ramblings of the Buk-buk owl and his two wives, we saw more pecked-marked carvings, but these were only one circle for each design, and as Jimmy chanted the song of that "Woman dreaming" he rubbed his hand around the pecked circle on the stones and explained that these stones were the women of the Buk-buk man of the legend, hence the sign-talk for breasts on the stones which is always a circle on the chest with most tribes.

At one place we came upon a series of painted white lines joined together on top with a white line, and Jimmy informed us that these were the hanging tails of the possum as it sits on a limb.

From the above it appears that the crude paintings and carvings of the original Northern Arunta or Wailbri tribesmen followed along the lines of thought as in sign-language for these ritual centres. Sign-language, with its taboos, becomes all-important in camp behaviour, for it is general knowledge that people under this speech taboo can only whistle when they wish to attract attention; and so deeply rooted is this prohibition on speech that I have been with Aborigines who, having been under this ban for years, when released, could often be seen with hands and fingers going in sign-talk as they "*thought* in sign-talk" just as people who live lonely lives will talk to themselves or *think aloud* as they wander around. So, by easy stages, we have thinking, thinking aloud and thinking in

sign-language, then painting in the sign language which could be called the abstract art of the Aborigines.

W. E. HARNEY.

The Sir William Dixon Collection in the Australian Museum, Sydney.

Since 1912 Sir William Dixon has presented to the Australian Museum at various times collections of anthropological specimens which now total almost 1,500 specimens. They are from Australia, New Zealand, Pacific islands, Ceylon and India. They include a very choice collection of 900 specimens from all over Australia and from New Guinea and the Bismarck Archipelago collected by Harry Stockdale, and another series of almost 200 specimens collected by A. Bringa Robertson. These specimens filled many gaps in the Australian collection of the Museum. In December, 1951, Sir William Dixon presented just over 400 specimens from Australia, New Zealand and Polynesia. There are 205 Maori pieces in this collection, and they include 13 wood carvings comprising a *pui-pui* board, three large human figures, a face-mask, two model canoe-prows, and several boxes; 12 kotiate and patu wooden hand-clubs, one staff and 10 paddles, all beautifully carved; eight wooden weapons, including *tewha tewha*, *taiaha* and clubs. The magnificent series of Maori jade or greenstone objects consists of seven *mere*, 20 adzes and chisels, 41 *hei-tiki*, 55 ear-pendants, three *peka peka* and five spiral pendants, two bird-leg rings or *poria*, an image of Tangaroa, god of fishing, and several other pendants. There are in addition from New Zealand a bone flute, two bone combs and four cloak-toggles, and several basalt and bone *mere*. Many of these specimens are beautiful examples of their type and they form a most invaluable addition to our Maori collection. Among the other specimens presented are old Tongan clubs, one of

which is dated 1798; a beautifully carved paddle from the Cook Islands; a *kava* bowl with coconut cup from Fiji; and 18 adzes, including greenstone implements, from New Guinea and New Caledonia. Of special interest are 22 brass breast-plates issued to aboriginal "kings," "chiefs," overseers, and other important individuals in New South Wales. Another most interesting item is the manuscript, with illustrations, of the first six Bulletins of North Queensland Ethnography, by Dr. W. E. Roth, published in Brisbane. Sir William's kindly interest in the Museum has been maintained for forty years, and to him we are indebted for numerous valuable specimens, as a perusal of the above list will reveal.

The Anthropological Society of Victoria : Syllabus 1952.

- February 13th: "Archæology and Culture History"—the techniques used in revealing the history of man in the Middle East. J. A. Thompson, M.Sc., B.D., Australian Institute of Archæology.
- March 12th: Members' Night.
- April 9th: "Village Life in India"—the impact of modern technology on a peasant economy. Muni Lal, Indian Office of Information, Sydney.
- May 14th: "Black and White in Three Trust Territories"—Native government in the Belgian Congo, Tanganyika and New Guinea. E. W. P. Chinnery, ex-Government Anthropologist, New Guinea.
- June 11th: "The History of Chinese Culture." C. P. Fitzgerald, Reader in Far Eastern History, National University, Canberra.
- July 9th: "Sticks and Stones"—the place of material culture in Anthropology. Presidential Address. Donald J. Tugby, Ethnologist, National Museum, Melbourne.
- August 13th: Annual Meeting. "Photographing Aborigines"—an account of recent field work in the Northern Territory. R. C. Seeger, Hon. Secretary, Anthropological Society of Victoria.
- September 10th: "The History of Pacific Art Styles"—a discussion of recent theories. Dr. Leonard Adam, F.R.A.I., Department of History, University of Melbourne.
- October 10th: Members' Night.
- November 12th: Symposium, "Anthropology in the World To-day".
- Interstate visitors are welcomed to the meetings of the Anthropological Society of Victoria, which are held in the B.M.A. Hall, Albert Street, Melbourne, opposite St. Patrick's Cathedral. Contact with the Society may also be made through the Hon. Secretary or the Ethnologist, the National Museum, Melbourne.

The Anthropological Society of Victoria

(Founded 1932)

OFFICE-BEARERS, 1951-1952.

President: Mr. D. J. Tugby, B.Sc.

Vice-Presidents: Mr. C. A. S. Mansbridge, B.A., F.R.G.S., Mr. H. R. Balfour.

Council:

Dr. Alan Griffiths, M.B., B.S., Col. Neil MacArthur, F.D., J.P., Mr. S. R. Mitchell, M.Aust.I.M.M., Rev. D. Rettick, Mr. H. C. Stewart.

Hon. Secretary: Mr. R. C. Seeger, 56 Jenkins St., Northcote, N.16.

Hon. Treasurer: Mr. H. R. Hammet.

Hon. Asst. Treasurer: Miss L. Young, 13 Chastleton Ave., Toorak, S.E.2.

Hon. Librarian: Miss S. M. Seeger.

Hon. Auditor: Mr. E. E. Lord.

Meetings are held in the H.M.A. Hall, Albert Street, Melbourne on Wednesday evenings as advertised, at 8 p.m. at regular intervals. Annual subscription (including free supply of MANKIND), 10/-

The Anthropological Society of Queensland

(Founded 1948)

OFFICE-BEARERS, 1951-1952.

President: Mr. G. Mack

Vice-Presidents: Professor H. J. Wilkinson, Dr. L. P. Winterbourn, M.B., B.S. (Meib.).

Council:

Assoc. Professor F. Robinson, Dr. B. Barrack, Assoc. Prof. M. Hickey.

Hon. Treasurer: Mr. I. W. Johnston, "Tilga," Park Rd., Yeronga, Brisbane.

Hon. Secretary: Mr. F. S. Collier, c/o Geology Department, University of Queensland, St. Lucia, Brisbane.

The Australian Anthropological Association

Members :

Anthropological Society of New South Wales.
Anthropological Society of South Australia.
Anthropological Society of Victoria.
Anthropological Society of Queensland.

OFFICE-BEARERS, 1951-1952.

President : Dr. N. W. G. Macintosh.

Hon. Secretary : Miss Gwen Bell, 164 Prince's Highway, Arncliffe.

Hon. Treasurer : Mr. F. D. McCarthy.

OBJECTS.

- (a) To promote the science of Anthropology.
- (b) To hold biennial conferences of delegates from affiliated societies to deal with matters affecting affiliated societies generally, or the science of anthropology.
- (c) To take public and official action in the interests of anthropology, as may be deemed desirable.
- (d) To encourage affiliated societies to co-operate in every possible way.

The Anthropological Society of N.S.W. as such is not responsible for any opinion or declaration published in this magazine, by whomsoever expressed, unless specifically stated to be so by the Editor.

All communications, MSS., and proposed advertisements to be addressed to Mr. F. L. S. Bell, M.A., Editor, City of Sydney Public Library, George Street, Sydney.

Persons interested in the work of the Society please address correspondence to the Hon. Secretary.